



# ARMY RESEARCH AND DEVELOPMENT



MONTHLY NEWSMAGAZINE OF THE OFFICE OF THE CHIEF, RESEARCH AND DEVELOPMENT  
Vol. 11 No. 1 • January 1970 • HEADQUARTERS, DEPARTMENT OF THE ARMY • Washington, D.C.

## Budgetary Cutback Forces Project THEMIS Halt to New Efforts

### ODDR&E Increasing Role of 3 Services

Reorganization of the Office of the Director of Defense Research and Engineering is under way to reduce the amount of direction and guidance to the Military Services, by delegating more responsibility and authority for action on approved programs.

In accord with Defense Secretary Melvin Laird's continuing expression of his philosophy of participatory management of weapons systems acquisition, DDR&E Dr. John S. Foster Jr. is restructuring ODDR&E directorates dealing with military programs along mission rather than functional lines.

Scheduled for completion about June 30, the realignment will result in a smaller staff (about 10 percent reduction in personnel) at ODDR&E level. Most projects will originate in the Military Services and be approved by DoD. Primary responsibility for their conduct will be with the services.

The policy shift means that detailed program supervision at ODDR&E level will change to long-range coordinated planning around mission areas.

Major offices in the Directorate of

Tactical Warfare Programs, for example, will address Land Warfare, Air Interdiction Warfare, Ocean Control, and Combat Support; previously they addressed Tactical Aircraft Systems, Tactical Ordnance and Missile Systems, and other functional areas.

(Continued on page 4)

### MBT Effort Reoriented To Unilateral Functions

Reorientation of the U.S./Federal Republic of Germany Main Battle Tank development program to reduce procurement costs, simplify operation and maintenance, and improve reliability, was announced Jan. 20.

Deputy Secretary of Defense David Packard said the modified MBT program makes some changes in the joint development relationship that has existed since the U.S. and FRG joint effort was initiated in 1963.

Each country now assumes unilateral technical decisions and unilateral funding, including funding of mate-

(Continued on page 4)

Project THEMIS, initiated in January 1967 as a presidential program funded through the Department of Defense to establish "new centers of excellence" in broadening the national base of academic competence in science and engineering, is being curtailed by budgetary cutbacks.

Launched with authorization by Congress of a first-year budget of \$20.5 million, and originally programmed for FY 1970 expansion at \$33 million, THEMIS has been slashed to \$12 million. The Office of the Director of Defense Research and Engineering said the cutback means that no new starts can be made in FY 1970.

Regarding the outlook for new starts in FY 1971, the ODDR&E spokesman said "it appears highly im-

(Continued on page 3)

### Weather Services Set Centennial Activities

Commemoration of the United States Weather Services' Centennial, beginning Feb. 9 with TV and radio coverage and highlighted Feb. 12-14 in Washington, D.C., with the first of a series of symposiums and special events, will serve to recall another important pioneering role of the U.S. Army.

History records that the first major U.S. interest in meteorological information arose from medical researchers probing the relationship of environment (in this case, climate) to sickness. The Army Surgeon General directed in July 1818 that weather observations be made at Army posts.

Nearly 52 years later, congressional

(Continued on page 9)

### AMC Probes Computers for Design, Engineering

Possibilities for exploiting potential power of the computer as an integral part of the total design and engineering process in U.S. Army Materiel Command laboratories are being explored in a broad new program.

Advances in computer technology have recently shown how a designer's efforts can be outputted on a cathode ray tube screen, as conception and design work proceed, enabling the designer to interact with the computer to modify and verify each step. Performance of a completed design can be determined by computer simulation, under specifically proposed environments.

Current progress in this technology started in 1963 when Ivan Sutherland of Massachusetts Institute of Technology conceived and developed "Sketchpad." The term computer-aided design was coined, referring to a computer interactive graphics display.

In view of the lack of a nationally

(Continued on page 6)



Brig Gen Mahlon E. Gates

### Featured in This Issue ....

Weather Services Centennial Points Up Army's Pioneering Role .....	p. 8
Army Agencies Report on Mine-Countermine Research Results .....	p. 14
Army Medical Research, Nutrition Lab Yields Benefits Worldwide .....	p. 20
WES Test-Load Cart Simulates Superjet Traffic on Airfields .....	p. 23
Army Reports on Advance in Meningococcal Meningitis Control .....	p. 32
Battelle Economists Forecast R&D Trends Projected in 1970 .....	p. 36

### WSMR Installs Complex Of Missile Computer Aids

Installation of a \$16.7 million complex of 12 computers at White Sands (N. Mex.) Missile Range for use in TEAM-UP (Test Evaluation Analysis and Management Uniformity Plan) is scheduled to provide a 4-fold increase in computing capability in 1970.

The program is designed to support technological advances in missile development and instrumentation used in range operations serving the Army,

(Continued on page 3)





Vol. 11 No. 1 • January 1970

Editor . . . . . Clarence T. Smith  
Associate Editor . . . George J. Makuta

Published monthly by the Army Research Office, Office of the Chief of Research and Development, Department of the Army, Washington, D.C. 20310, in coordination with the Technical and Industrial Liaison Office, OCRD. Grateful acknowledgment is made for the valuable assistance of Information Offices within the U.S. Army Materiel Command, U.S. Continental Army Command, Office of the Chief of Engineers, and Office of The Surgeon General. Use of funds for printing of this publication has been approved by Headquarters, Department of the Army June 6, 1967.

**Purpose:** To improve informal communication among all segments of the Army scientific community and other Government R&D agencies; to further understanding of Army R&D progress, problem areas and program planning; to stimulate more closely integrated and coordinated effort among Army R&D activities; to express views of leaders, as pertinent to their responsibilities, and to keep personnel informed on matters germane to their welfare and pride of service.

**Picture Credits:** Unless otherwise indicated, all illustrations are by the U.S. Army.

**Submission of Material:** All articles submitted for publication must be channeled through the technical liaison or public information officer at installation or command level.

**By-lined Articles.** Primary responsibility for opinions of by-lined authors rests with them; their views do not necessarily reflect the official policy or position of the Department of the Army.

**DISTRIBUTION** is based on requirements submitted on DA Form 12-4. Army agency requirements must be mailed to the U.S. Army AG Publications Center, 2800 Eastern Boulevard, Baltimore, Md. 21220.

Distribution on an individual name basis is restricted to members of the U.S. Army Atomic Energy and R&D Officer Special Career Programs and to R&D Mobilization Designees. Otherwise, distribution is made only to the Army installation, office or organizational element to which the requester is assigned.

**CHANGES OF ADDRESS** for AE and R&D Officer Special Career Program enrollees should be addressed to: Specialist Branch, OPXC, Department of the Army, Stop 106 Washington, D.C. 20315. R&D Mobilization Designees should contact the Office of Personnel Operations, Reserve Components Center, Fort Benjamin Harrison, Indianapolis, Ind. 46249—ATTN: Mob Des Career Branch.

**OTHER GOVERNMENT AGENCIES'** requirements should be submitted directly to the Army Research Office, OCRD, Department of the Army, Washington, D.C. 20310, ATTN: Data Management Division, Publications Branch.

**ALL NON-U.S. GOVERNMENT** agencies, firms and organizations must obtain this publication through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Single copies sell for 20 cents. Subscription rates (12 issues annually) are: Domestic, APO and FPO addresses, \$2.25; Foreign, \$3.00.

## LWL Broadens R&D Scope With Revised Mission

LWL no longer denotes the U.S. Army Limited War Laboratory but still applies to its redesignation as the U.S. Army Land Warfare Laboratory, effected by General Order No. 5 issued Jan. 21 by the Office of the Chief of Research and Development, HQ DA.

The change reflects a substantial broadening of LWL responsibilities as an R&D focal point for quick response to urgent and unique or highly specialized requirements of U.S. Army combat forces worldwide.

LWL Commander Col Rudolph A. Axelson explained that the revised mission will not in any way impinge on general materiel development responsibilities assigned to the Army Materiel Command.

Under functional assignments set forth in its revised mission statement, the LWL will "provide a centralized quick-reaction R&D facility for accomplishing development of specialized military items and for generation of new ideas for such materiel."

In broadening its sphere of operations for R&D of special materiel, the LWL will be able to diversify activities to use more effectively the broad

range of scientific and engineering skills assembled for the LWL professional staff when the laboratory was established in mid-1962.

Col Axelson and Milton Cutler, chief of the LWL Advanced Development Division, gave the first of a series of planned briefings on the expansion of functions to the Defense Communications Planning Group Jan. 22. Col Axelson and Jack Ackerman, chief of the Development Engineering Division, will leave Feb. 2 for a briefing at HQ U.S. Army Pacific Command (USARPAC).

A similar presentation to leaders of Project MASSTER (Master Army Sensor Systems Test, Evaluation and Review) is planned in the near future at Fort Hood, Tex. LWL key personnel will be provided for briefing of other commands as desired.

Since its establishment, the LWL has been widely acclaimed for its rapid response in developing many specialized items of materiel and equipment urgently needed in Southeast Asia combat operations. This theater will continue as LWL's primary area of responsibility.

## 8th NJSHS Slated May 6-9 at University of Tennessee

U.S. Army Junior Science and Humanities Symposia (JSHS) activities involving more than 5,000 of the nation's most talented high school students aiming at careers in these fields will reach a 1969-1970 climax May 6-9 at the University of Tennessee.

The Eighth National JSHS, sponsored by the Army Chief of Research and Development with the U.S. Atomic Energy Commission, Union Carbide Co. and the University of Tennessee as cohosts, will be attended by about 150 selected students.

Participation will be swelled by 50 to 60 teachers representative of the 25 regional JSHS held each year throughout the United States.

Additional participants will be representative of industry, the academic community and the regional JSHS directors. The over-all JSHS Program is administered through the U.S. Army Research Office, Durham, N.C.

Seven guest speakers of national importance will make presentations related to science and the humanities. The keynote speaker had not been selected as the *Army Research and Development Newsmagazine* went to press.

Definitely scheduled are Dr. Lewis M. Branscomb, director, National Bureau of Standards; Dr. Leon Pomerance, trustee, American Institute of Archaeology; Dr. Allan Heilman, assistant professor of botany, Univer-

sity of Tennessee; and Dr. William Pollard, director of the Oak Ridge Association of Universities.

Other featured speakers include Dr. Edward Bettis, head of the Power Reactors Division, Atomic Energy Commission Laboratories at Oak Ridge, and Dr. Norman Anderson, systems director, Biological Division. They will address the visitors during a tour of the AEC Labs and the Tennessee Valley Authority's Bull Run power station, the largest steam generating plant in the world.

Numerous eminent authorities in the fields of ecology, environmental pollution, population control and other problem areas envisioned as being of the greatest national importance during the 1970s decade will take part in round table discussions.

Panel discussions on other national problems in recent years have proved to be the most popular part of the National JSHS since they enable students, teachers and distinguished national leaders to exchange views on problem solving.

### 'The Case for Defense R&D'

Director of Defense Research and Engineering Dr. John S. Foster Jr. presents "The Case for Defense Research and Development" in a featured article in the Winter 1970 *Perspective* magazine published quarterly by Cornell Aeronautical Laboratory, Inc.



# Budgetary Cutback Forces Project THEMIS Halt to New Efforts

(Continued from page 1)

probable that they can be funded." Stressed, however, is that the ban on new starts does not affect the status of ongoing research programs in the THEMIS effort.

Envisioned objectives of THEMIS in 1967 included the establishment, over a 4-year period, of the new centers of scientific and engineering excellence in universities in virtually all of the 50 states.

Progress toward that goal has been consistent until the recently directed slowdown in extension of the project. In 1967 contracts supported new research efforts at 41 universities in 31 states. A recent tabulation showed that 76 universities in 42 states have benefited from the total expenditure of \$75 million since Project THEMIS began.

Conceived as a response to congressional demands for broader distribution of federally supported research and development activities in universities throughout the nation, THEMIS was designed to tap the talents at academic institutions that had not received substantial Department of Defense funding for research.

Under criteria for consideration of research proposals submitted by the universities, only those that had not received over \$3 million in DoD R&D funding the previous year were eligible for new-start contracts.

In Greek mythology, Themis was a Titaness concerned with the law and harmony of physical phenomena. Project THEMIS has supported a broad range of interdisciplinary basic and applied research in universities. One requirement, however, is that efforts must be related directly to defense technological and operational needs.

The initial approach to the project in 1967 entailed solicitation of research proposals in scientific areas specifically related to the military functions of the U.S. Army, Navy and Air Force. Sponsorship and technical supervision of the research efforts has been equitably distributed among these agencies.

THEMIS research has focused on such military functions as detection and surveillance, power generation and energy conversion, electronic data processing for many applications, and vehicle engineering for mobility on land and sea surfaces as well as in the air and undersea.

One of the areas of research currently of mounting national control concern—man's environment—has been treated in THEMIS from a special viewpoint—the need to improve

understanding of the environment as it influences military operations, biological and medical support of troops, and training.

Each THEMIS program has received funding at an annual rate of about \$200,000. Nationwide interest of academic institutions in the project is evidenced by the submission of more than 1,000 research proposals to date, of which only 118 received funds.

Preliminary proposals in 1967 totaled 480 from 171 universities; 106 were selected in 68 schools for more detailed submissions. Final evaluation, resulting in 49 contract awards to 41 universities, gave consideration to scientific quality, relevance to military functions, qualifications of the research staff, and adequacy of research facilities.

One of the important criteria applied to the evaluation was the compatibility of the proposed program with the established educational goals of the proposing institution.

Successful competitors were awarded contracts providing funds initially for the equivalent of two years of research on a 3-year step-funding basis. Insofar as funds permit, and as warranted by the productivity of the effort and relevance to the military mission, the ODDR&E said it is planned to assure meritorious programs at least the equivalent of three years of start-up support.

New starts decreased in FY 1969 as compared to the two previous years, with 26 contract awards to 22 universities in 18 states, selected from 196 proposals by 110 universities. Sustaining and new-start funding totaled

\$28.5 million.

In acknowledging that "many more good proposals were received than could be funded" during three years of THEMIS operations, an ODDR&E official commented that the over-all quality of results has justified the concept of the project.

Appreciation was expressed for the "strong endorsement of the program by chief executives of the institutions submitting proposals." The consensus appears to be that the project is effectively serving its objectives, and that results are finding applications to DoD requirements of significant importance.

University THEMIS personnel have provided many free consultation services to Army laboratories and have participated in joint seminars. University personnel have worked during the summer months in Army laboratories, and several graduates who have worked on THEMIS tasks have become Army R&D employees.

In commenting on the effectiveness of the "coupling" of results, a recent Army report on THEMIS accomplishments states:

"There has been a significant exchange of information, joint use of facilities, and consultation among the THEMIS universities and the Army laboratories. The fact that the technical administration of the Army THEMIS program is at the laboratory level facilitates the speedy transfer of scientific information and guidance among the university THEMIS personnel and our laboratory personnel. This process tends to keep the THEMIS efforts highly relevant to Army objectives."

## WSMR Installs Complex of Missile Computer Aids

(Continued from page 1)

Navy, Air Force, and National Aeronautics and Space Administration.

The multiprocessing system contract calls for installation of five UNIVAC 1108 and seven 418-11 computers. When completed the facility will perform functions in mass data processing, simulation, mathematical and statistical problem solving, and real-time guidance and control of up to six missiles at a time.

More specifically, the system will provide a real-time capability in the performance of instrumentation checking, sensor reassignment during missile countdowns and flights, in-flight missile testing and analysis, meteorological computations, fault analysis, generation of display instrumentation, and range safety information.

UNIVAC officials said the system will link about 118 terminal devices at 23 locations (some as far as 500 miles from WSMR) with the central computer complex in speeds ranging from 150 to over 600,000 bits a second.

Direct communications with the computer system will be possible for range instrumentation such as radars, telemetry systems, cinetheodolites, tracking telescopes, command-control radio transmitters and receivers, and graphic display systems.

The system's mass memory will store two and one-third billion bits of information, with a retrieval time under 5-thousandths of a second. The main memory will store more than 14.1 million bits of information with an access time of less than one-half millionth of a second.



# MBT Effort Reoriented to Unilateral Functions

(Continued from page 1)

rials and services each requests from the other. Exchange of information and support will continue, with cooperation to achieve a measure of com-

## ODDR&E Restructuring Role of Military Services

(Continued from page 1)

In the Directorate of Electronics and Information Systems, a new Office of Information and Communications, and an Office of Intelligence, will replace three offices handling Command and Control, Communications and Electronics, and Intelligence Reconnaissance and Electromagnetic Warfare.

The ODDR&E Directorate of Strategic and Space Systems, which handles weapons systems acquisition, is not subject to the same type of reorganization as the other two directorates, since it has been structured for some years along mission lines. It has offices for Strategic Weapons, Defensive Systems, and Space Technology.

monality in respective tank programs.

The modified MBT production is programmed to begin in the United States in the mid-1970s, several months later than was scheduled.

Redesign of selected MBT components will be required to achieve the goals of the revised program. DSD Packard said the first six months of calendar year 1970 will be devoted to further studies of the fire control, stabilization and secondary weapon system. In other areas, such as the hull and turret, suspension and power pack, design revisions approved in December will be completed.

Hopefully, the modifications ultimately will result in savings of about \$200,000 for each MBT. Although a substantial cost reduction has been identified, the specific figure will not be available until the final design is defined about June 1970.

Maximum use of technical developments already accomplished will be made in the revised MBT program. New management checkpoints in the development scheduled will emphasize reliability, durability, and thorough

test before commitment to production.

In making the decision, DSD Packard and Secretary of the Army Stanley R. Resor considered several alternatives. One of these was increased procurement of the present M-60 tank, or development of an upgraded M-60 tank. Another alternative was to continue with the joint U.S./FRG MBT program. The other alternative, which was adopted, was the modified binational MBT program providing for increased national control and cost reduction.

Some of the important features of the modified MBT, which it is planned will be manned by three men instead of the four used in current-generation tanks, will be spaced armor, an automatic loader, capability to fire on the move, a stabilization system, capability to fire both high-velocity ammunition and the Shillelagh missile, increased mobility, a fire-control system accurate at long ranges, and ability to fight at night.

## AVSCOM Plans Science Fair In Honor of General Bunker

Announcement of the William B. Bunker Memorial Science Fair, as an annual tribute to the deputy CG of the U.S. Army Materiel Command when he died June 6, 1969, has been made by the Aviation Systems Command.

Planned in April 1970 and focused on an aeronautics theme, the fair will be open to junior and senior high school students who are dependents of members of the participating organizations. It will be held in the Federal (Mart) Building, sometimes called the "St. Louis Pentagon."

Participating organizations include the Army Aviation Systems Command, which he commanded for nearly seven years; the Lindbergh Chapter, Army Aviation Association of America, and Army Aviation Chapter No. 54, Armed Forces Management Association. Both of the chapters were founded in St. Louis by General Bunker, who later served as national president of the latter association.

Other sponsors include local chapters or sections of the Association of the United States Army, the American Helicopter Association, American Institute of Aeronautics and Astronautics and the Missouri Society of Professional Engineers.

Serving on the steering committee headed by Lt Col Dean Wright are Dean Stravato, Bell Helicopter Co., who is Army Aviation Association coordinator, Larry Franzol of the Project Manager's Office and Dave Sevier, AVSCOM.



3 U.S. ARMY EXHIBITS at the American Association for the Advancement of Science exposition in the War Memorial Auditorium, Boston, Mass., Dec. 26-31, drew much favorable comment. Displayed were "Portable Power Sources," Army Electronics Command; "A Portable Laser," Army Research Office-Durham (N.C.); and "Volume Cycle Respirator," a fluidics controlled device developed by the Army's Harry Diamond Laboratories. Symposium topics of prime Army interest included "Academic Research and the Military"; "Innovation"; "Methods in R&D Management"; and "Engineering and Management Skills." Harold Davidson, (extreme left), Army Research Office, was the Army exhibits project officer.



## Lance to Undergo Firing Tests in Accelerated Program

Accelerated development of the Lance missile is programmed during 1970, with an undisclosed number of test shots scheduled at White Sands Missile Range (WSMR), N. Mex.

Tests at Fort Greely, Alaska, will determine how effectively equipment and soldiers can operate under extremely cold weather conditions.

Lance already has undergone a variety of environmental tests under desert and tropic conditions. The sys-

tem was successfully test fired at WSMR in 1969 after being "cold soaked" to 40 degrees below zero.

Built to withstand rough handling and severe climatic conditions, the 3,300-pound, 22-foot-long Lance is the first Army tactical missile to employ an engine with dual-thrust chambers; also the first to use prepackaged liquid propellants.

Development effort is a high-priority program of the U.S. Army Mate-

## Army, Marine Corps Evaluate XM191 Rocket System

Operational evaluation of a multishot, shoulder-launched rocket system with incendiary warheads is under way by U.S. Army and Marine Corps forces in South Vietnam.

The XM191 system was conceived and designed by the U.S. Army Weapons Development and Engineering Laboratories, Edgewood (Md.) Arsenal, where most U.S. Army's flamethrowers have had their origin. Development was done under contract.

Tests to date have established that the XM191 is extremely accurate up to 200 meters (point targets) and is effective at ranges up to 730 meters (area targets), far greater than standard and mechanized flamethrowers. The system also is lighter and more economical.

Four fiber-glass launching tubes are assembled in an arrangement extended to 34.75 inches with a clip of four 21-inch, 3-pound, 66mm rockets. Weight with the clip is 26.6 pounds. The weapon can be fired from standing, kneeling, sitting and prone positions. Replacement clips are easily insertable. Muzzle velocity is 360 feet a second.

The XM191 went from the drawing board to field testing, limited production and operational use in South Vietnam in less than three years. Edgewood Arsenal engineers said this was accomplished by the use of launching tubes, the M54 rocket motor in production since 1961, fuse assembly, igniter and aluminum clip tubes from existing production lots of the M72 LAW.

Capable of being operated in all types of weather, the XM191 has a firing mechanism that is completely mechanical. Cam rotation is in four 90° increments. The sight is the same M-30 optical sight used on the 3.5" Bazooka. No maintenance is required and adjustments can be made with a screwdriver.

In combat, the launcher operator carries the weapon loaded with one rocket clip. Extra clips are carried by other squad members.



XM191 Rocket System

## Natick Technologist Wins SARS Fellowship

Under the Secretary of the Army Research and Study (SARS) Fellowship Program to encourage development of civilian employees whose records indicate outstanding potential for future service to the Army, Constantin J. Monego has started a year of textile research in foreign countries.

Employed as a textile technologist at the U.S. Army Natick (Mass.) Laboratories, he will center his experimentation and studies at the University of Manchester Institute of Science and Technology in England.

The SARS proposal he submitted also provides for visits to Scotland, Sweden, West Germany and Italy to consult with textile scientists in universities and industry regarding recent technological advances.

Graduated with a BS degree in textile engineering from Philadelphia Technical Institute, where he served five years as an assistant professor, Monego received an MS degree in textiles from the Massachusetts Institute of Technology, and entered federal service in 1951.

Monego is affiliated with the Textile Research Institute; American Association of Textile Chemists and Colorists (AATCC), in which he is secretary for the Northern New England Section; Intersociety Color Council; American Society for Testing and Materials; Research Society of America; and the Fiber Society.

He is the author of numerous technical publications and professional articles, and is a staff member of the Shelters and Organizational Equipment Division, General Equipment and Packaging Laboratory at Natick.



Constantin J. Monego

riel Command. The Army Missile Command (MICOM), Redstone Arsenal, Ala., is managing the program and the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, Md., is responsible for system analysis.

Two major WSMR organizations are involved in the development program, but other organizations support the tests.

WSMR deputy for Army Missile Test and Evaluation (ARMTE), Col George H. Farne, has a dual responsibility. His organization sponsors the development program conducted for MICOM, and also provides engineering test analyses and evaluation for TECOM.

Thomas E. Jameson is Lance project engineer for the ARMTE development program. Analyses for TECOM are handled by ARMTE's Systems Analysis Directorate, headed by Dr. W. R. Jewell. Lance work in this area is assigned to the Surface-to-Air Missiles Div., headed by C. W. Peterson.

Range support for firings at WSMR is coordinated by the Range Programs Office, National Range Operations (NRO). Col Robert T. Townsend is deputy for NRO; Paul W. Welch Jr., is chief of Range Programs.

A Lance development field force of 50 persons is employed at WSMR by LTV Aerospace Corp., prime contractor. Col A. F. Pottle Jr., MICOM, is project manager.





**ARMY MATERIEL COMMAND (AMC) Computer-Aided Design and Engineering Council.** *Front row, from left, J. M. Flanagan, U.S. Army Natick (Mass.) Labs; R. Schwartz, U.S. Army Munitions Command (MUCOM), Dover, N.J.; Col W. M. Boggs, HQ AMC; R. N. White, HQ AMC; A. W. Rogers, U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J. Second row, W. C. Osborne, U.S. Army Management Engineering Training Agency, Rock Island (Ill.) Arsenal; R. M. Dunn, ECOM; J. C. William, HQ AMC; P. O. Langguth, HQ AMC; E. N. Petrick, U.S. Army Tank-Automotive Command (TACOM), Warren, Mich.; R. E. Hopkins, U.S. Army Mobility Equipment Command, St. Louis, Mo.; J. M. Bialo, U.S. Army Test and Evaluation*

*Command, Aberdeen Proving Ground (APG), Md. Back row, W. J. Sacco, U.S. Army Ballistic Research Laboratories (BRL), APG; E. P. Burke, MUCOM; R. P. Uhlig, HQ AMC; L. Epstein, U.S. Army Aviation Systems Command (AVSCOM), St. Louis; S. F. Heal, TACOM; J. P. Leonard, U.S. Army Missile Command, Redstone Arsenal, Ala.; O. C. Kaste, BRL; Dr. R. Beckett, U.S. Army Weapons Command, Rock Island Arsenal. Brig Gen Mahlon E. Gates, deputy director for Operations, AMC Research, Development and Engineering Directorate, and Dr. J. V. E. Kaufman, deputy director for Plans, RD&E Directorate, were not present when photo was taken.*

## AMC Probing Computers as Design Aids

(Continued from page 1)

accepted definition, AMC is considering adoption of: "Computer-aided design and engineering is the application of automated techniques enabling the engineer to accomplish his normal functions in concept, design and design evaluation."

Establishment of an AMC Computer-Aided Design and Engineering Council to promote and assist in development of a program for application of computer technology to design and engineering of military materiel was announced at a recent symposium.

Speaking to the joint Department of Defense and industrial gathering on Computer-Aided Design (CAD) and Computer-Aided Manufacturing/Numerical Control (CAM/NC), AMC Deputy CG Lt Gen H. A. Miley outlined the program under development by the AMC.

AMC Regulation 15-12, dated Oct. 14, 1969, provides for the organizational alignment of the council and delineates the scope of its mission.

Council members are key personnel from RD&E elements of each AMC major subordinate command, principal laboratories, the U.S. Army Management Engineering Training Agency (USAMETA), the AMC HQ Requirements and Procurement Directorate

and Management Information Systems Directorate.

Brig Gen Mahlon E. Gates, deputy director for Operations, AMC Research, Development and Engineering Directorate, is council chairman. Dr. J. V. R. Kaufman, deputy director for Plans, RD&E Directorate, is deputy chairman.

Council functions include guidance for interchange of information within the Materiel Command, the Military Services, U.S. Government agencies, industry and the academic community. Army representation on the Department of Defense Tri-Service Ad Hoc Committee on Interactive Graphics also is guided by the council.

The newly established Engineering Division of the AMC RD&E Directorate has been providing Army representation on the DoD committee, which is concerned principally with joint 3-dimensional graphics projects. The division also provides the Secretariat for the CAD-E Council. Through a working group chaired by an Army member, a survey is being made of ongoing interactive graphics research projects in industry and universities, preliminary to making a joint applications commitment.

In the keynote address to the first meeting of the AMC council, General

Gates discussed "Opportunities of Computer-Aided Design in AMC," thereby providing guidance for the initial activities of the council.

Cmdr L. D. Ballou, U.S. Naval Ship Engineering Center, presented "Computer Applications in Naval Ship Design and Construction." Senior Staff Scientist S. H. Chasen spoke on "Computer-Aided Design at Lockheed-Georgia Company," where significant progress in the technique is reported.

Other major presentations included "Computer Applications in Research, Design and Evaluation of Military Vehicles," S. F. Heal, U.S. Army Tank-Automotive Command; "Computer-Oriented Analysis and Parametric Design in Weapons Design," Dr. R. C. Beckett, U.S. Army Weapons Command; and "Summary of CAD-E in AMC," Richard W. White, deputy chief, Engineering Division, HQ AMC.

AMC working groups are being formed in major commands and elements to deal with exploitation of computer-aided design in specific task areas. Initial projects are being selected from those considered most essential and broadly applicable to problems in ongoing RD&E activities.

Additional early projects of the council will be concerned with the education of selected AMC personnel in computer-aided design and engineer-



ing technology, development of a common engineer-oriented graphic language, and work on low-cost satellite graphic terminal devices.

Extensive contracts during the past nine months with other U.S. Government agencies, the academic community and with industry in the U.S. and abroad have indicated that AMC exploitation of computers in all phases of design and engineering is of high-priority importance.

Visits to numerous AMC installations during the same period have shown increasing applications of computers (mainly analog) to design and engineering problems. Significant results are being achieved, particularly in simulation.

In recognition of lack of a coordinated program for systematic exploitation of the state-of-the-art, or for advancing the technology, the AMC made a survey of major subordinate commands and other installations having design engineering responsibilities. Ongoing programs were reviewed and proposals for future developmental efforts were solicited.

The survey established that more than 500 computer programs and routines existed in AMC for the solution of specific or generalized design problems. The large number of new proposals received in response to the survey indicated the extensive interest placed on CAD-E at AMC activities.

One proposal, for example, called for "development of an interactive, computer-aided, multidiscipline engineering design, evaluation and analysis (MEDEA) system, including controls, command and query language, data base, graphic terminal controls,

3-dimensional geometry package, technical analysis aid for engineering disciplines throughout the AMC. . . ."

Within recent months the AMC also completed a study of mechanical stabilization problems in mobile military equipment involving control feedback problems. It was determined that increased use of advancing computer technology within the AMC would simplify the design process and provide a better product.

Paul O. Langguth, general engineer for CAD-E, and an AMC action officer for CAD-E, said one of the findings was that a broader range of designs could be analyzed and "debugged" on the computer, thus avoiding the necessity of successfully building hardware models for performance tests and subsequent "intuitive" redesign.

Subsequently, several mathematical models have been made to deal with outstanding problems. Performance simulation tests are under way.

The U.S. Army Electronics Command of AMC has for a number of years been doing extensive research and development on automated display techniques and devices applicable to command and control problems.

More recently, the National Bureau of Standards, in conjunction with the Electronics Command Communications and Automatic Data Processing Laboratory, has been working on development of advanced concepts for utilization of various display techniques in remote devices, using a multiple access, time-shared computer facility.

One of the results of the NBS-ECOM collaboration is the interactive graphics display system (CAD-E) pictured in Figure 1. This work has been preliminary to satelliting the interactive graphics terminal now being made operational at HQ ECOM, Fort Monmouth, N.J.

General Gates, in speaking to the AMC Computer-Aided Design and Engineering Council at its Dec. 4, 1969 meeting, said that the AMC must first determine what particular design project(s) should be accomplished by CAD-E. He added that it may prove desirable to establish two pilot interactive computer graphics facilities, one in the electronics area (Fort Monmouth) and the other in the mechanical design area.

Use of computers to solve design and engineering problems, a field in which industry has made the major gains in recent years, actually originated with the Army. The need was recognized for advanced technology to solve problems with which the Ballistics Research Laboratories at Aberdeen (Md.) Proving Ground were dealing in World War II.

The world's first computer, the ENIAC, was developed jointly by engineers and scientists of the BRL and the University of Pennsylvania in 1945. ENIAC's prime function then was to calculate projectile trajectories and firing tables. Its obvious potential for other military and civilian requirements spawned the current multibillion dollar computer industry.

Outstanding success achieved in recent years in use of computers for numerical control in production of machine tools also can be traced to a military contract sponsored at Massachusetts Institute of Technology.

Numerical control technology is now gradually approaching the phase where automated machine tools will be operated directly from a computer, without the use of intermediate tapes or punched cards.

General Gates has stated that the time is opportune for the AMC to initiate a coordinated effort in advancing the benefits of computer technology in the design and engineering of military equipment.

Although the AMC does not have an interactive computer graphics facility as yet, nor advanced automated drafting capabilities, he said, "we are in the fortunate position of being able to take advantage of progressive and extensive developments made by others . . . ."

"As we go along," he added, "it is quite probable that our RD&E people will achieve certain breakthroughs in software and hardware, simplifying the automation of the design process."

## ECOM Arranging Program For Power Sources Meeting

More than 800 industrial and educational leaders will join with Department of Defense power sources researchers at the 24th Power Sources Symposium to be held May 19-21, Atlantic City, N.J.

Sponsored by the U.S. Army Electronics Command (ECOM), Fort Monmouth, N.J., in cooperation with the U.S. Army Materiel Command, U.S. Army Mobility Equipment R&D Center, Harry Diamond Laboratories, and the Interagency Advanced Power Group, the conference is the largest of its kind.

A preliminary program slates sessions on primary and secondary batteries, fuze power sources, power processing, fuel cells, thermal energy conversion, and a general session.

Speakers for the program had not been announced when this publication went to press. David Linden, ECOM, is chairman of the Conference Steering Group.

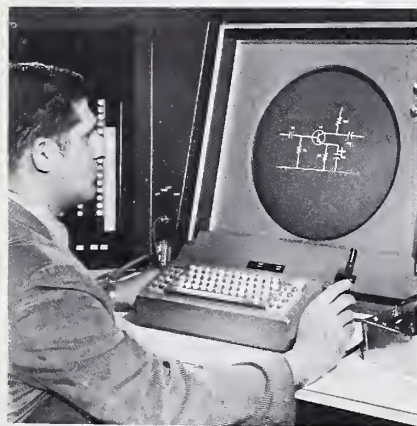


Fig. 1. ELECTRONIC CIRCUIT DESIGN is displayed on screen of MAGIC II at Computer R&D Facility, National Bureau of Standards. The interactive graphics system was developed in conjunction with the Communications and Automatic Data Processing Laboratory, HQ U.S. Army Electronics Command.



# Weather Services Centennial Points Up Army's Pioneering Role

Historically documented information regarding the role of the U.S. Army as the forerunner to the establishment of the U.S. Weather Services is contained in a paper presented to the 161st National Meeting of the American Meteorological Society.

Mrs. Frances L. Whedon, now a staff meteorologist in the Environmental Sciences Division, Army Research Office, Office of the Chief of Research and Development, HQ DA, authored and presented the paper at the meeting to commemorate the Army Signal Corps' Training Program in World War II.

Until The Surgeon General directed in July 1818 that weather observations be made at each Army post, collected and published, there was in the United States no arrangement for collection of data which would permit continuous analysis and forecast.

Medical researchers endeavoring to link the relationship of the climate to illness were the most important users of this information. Little was done, despite the efforts of Joseph Henry, then the secretary of the Smithsonian Institute, in arranging for statewide records and analysis, to provide effective weather forecasts.

Increased shipping traffic by way of the Great Lakes led to proportionate rises in losses of ships, becoming a matter of concern to the U.S. Congress in the 1860s. Rep. Holbert E. Paine, in December 1869, prepared a joint resolution providing for a storm warning service to be organized by the Secretary of War.

Rep. Paine believed military discipline would provide the necessary "promptness, regularity and accuracy" essential to reliable weather forecasting, and that the War Department could provide the service more economically since it was meeting some expenses of such a service.

The U.S. Army Signal Corps originated June 27, 1860, when Albert J. Myer, an assistant surgeon, was appointed Signal Officer to develop a system of military communications. He was allotted \$15,000 for the first meteorological service, as directed by the Secretary of War, for the year ending June 30, 1870.

As an Army surgeon, Myer had a special interest in visual signaling systems or sign language for use by deaf mutes. This led to interest in getting information from one military unit to another, and he experimented with a number of methods. One was a flag system, and crossed flags later became the Signal Corps' insignia.

Experiments with torches and

glasses in addition to flags led to the wig-wag system, which was recognized by the War Department in 1858. General Order No. 17, July 2, 1860, as authorized by Act of Congress, directed appointment of a Signal Officer with the rank, pay and allowances of a major in the Cavalry, and designated Albert J. Myer for the job.

The President of the United States directed in August 1867 that Col Myer become Chief Signal Officer of the Army, and was assigned his own troops. During the Civil War troops had been assigned to the Signal Corps, but when hostilities ceased they were again detailed to the Corps.

The joint resolution of Congress Feb. 9, 1870, required the Secretary of War "to provide for taking meteorological observations at military States and Territories and for giving notice on the northern lakes and on the sea coast by magnetic telegraph and marine signaling of the approach and force of storms."

The need for geographic distribution of observation stations was recognized at the outset. Each station was equipped with a barometer, thermometer, hygrometer, anemometer, anemoscope, and pluviometer. Except for a few stations, however, development of stations west of the Mississippi was slow.

A Pacific Coast chain of meteorological observing stations, including one in the Aleutian Islands, was in operation by 1875 and by 1878 the Signal Corps had established 224 stations.

Officers and enlisted men were trained at Fort Whipple, now Fort Myer, Va. Meteorological probabilities (weather forecasts) were exchanged with Canadian stations, and a daily bulletin was distributed to 9,000 post offices.

In addition, a weekly "Weather Chronicle" was published and special studies were made of tornadoes and great storms to improve forecasts.

As part of Signal Corps' participation in the First Polar Year, 1st Lt Adolphus W. Greely was assigned to lead an expedition into the Arctic to make meteorological and magnetic observations for international use.

Originally supplied for two years, the expedition was scheduled for resupply in its second year, but the relief expedition failed its mission. Greely's force remained in the Arctic from July 1881 until rescued in 1884, by which time the group of 24 had dwindled to 7 survivors.

Scientifically, the expedition was a success. Observations were completed over a much longer period than origi-

nally planned. Greely brought back an unbroken series of meteorological, tidal, magnetic and pendulum observations of great value to the international study of such phenomena.

Meanwhile, efficiency of meteorological services in the U.S. was crippled for lack of funds, necessitating the closing of several stations. Funds for telegraph reports of storm warnings were insufficient. Service was sustained by the gratuitous assistance of Western Union Telegraph Co.

In 1887, when Greely held the rank of captain, he became Chief Signal Officer and was promoted to brigadier general. Civilian activities had by that time absorbed the greatest percentage of time of an essentially military organization.

General Greely initiated the recommendations which led Congress to provide, on Oct. 1, 1890, that "operation of the Corps should be confined to strictly military matters." Meteorological observations, except for military use, were transferred to the Weather Bureau of the Department of Agriculture, including the majority of Signal Corps' meteorological personnel.

Signal Corps' activities subsequently were directed largely to development of instruments and methods for obtaining ballistic data for artillery and small arms firings, and in support of Army operations. Activities on a peacetime basis were small.

In December 1907, as an offshoot of Signal Corps communications functions involving what is now called surveillance—which had involved use of various types of manned balloons to obtain observations of the enemy—an epochal action was taken.

Specifications were prepared and proposals invited for a heavier-than-air machine, speed 40 mph, to remain in the air one hour and to be at all times under control. Contracts were awarded to the Wright Brothers and to A. W. Herring, leading to tests of the Wright aircraft in 1908-09.

Knowledge of weather conditions linked to increasing interest in heavier-than-air machines for military use became of rising importance, but rapid development in use of meteorology for military purposes was delayed until early in World War I.

When the U.S. entered the war, the British and French already had found that peacetime meteorological services were not adequate for military requirements. American meteorological work was planned in the light of that experience.

The first American stations were



established at Aviation and Artillery Training Centers, and stations in the combat zones were equipped with radio for transmittal of their information. Instructions for observations and firing control were expedited.

In World War I, Signal Corps' meteorological service was used for Artillery, Air Service, bombing and gas operations. Forward meteorological stations in the combat zone were credited with providing valuable information.

Rapid training of men to provide this service, in view of the crippled capability of the Signal Corps meteorological activities at the outset of the war, was a primary requirement.

The Weather Bureau provided the Signal Corps competent leadership to assist in the training program at Texas A&M, where a School of Meteorology was opened at College Station. The first 150 men were sent to Weather Bureau Stations in the U.S. for training.

Thirty-seven military stations were established in the U.S., mostly at military posts, to furnish meteorological information taken at the surface and in the upper atmosphere.

Responsibility for observational work within American Expeditionary Forces throughout World War I was assigned to Col William R. Blair, later to gain recognition as "Father of Radar." Col Blair also worked with Dr. Harry Diamond, founder of the Army's Diamond Ordnance Fuze Laboratories (now the Harry Diamond Laboratories), in early development of the audio-modulated radiosonde, the basic instrument used today for upper-air observations.

Responsibility for U.S. Army meteorological work in the U.S. were then Capt B. J. Sherry and Lt Waterman, later to gain renown as Dr. Alan T. Waterman Sr., who became the first director of the National Science Foundation in 1950 and served until 1963.

One of the most complete descriptions of meteorological activities during World War I can be found in the 1919 report of the Chief Signal Officer. With the end of hostilities, meteorological activities of the Signal Corps were again reduced, but the need for meteorological stations within the U.S. mounted with the growth of military aviation.

In July 1914, Congress had authorized the establishment within the Signal Corps of an Aviation Section, but money shortages had not permitted full manpower strength. Under the spur of the wartime emergency, aviation passed from control of the Signal Corps.

The Army Air Corps was estab-

lished in May 1918 as a separate Technical Service of the War Department, and weather forecasting for aviation was assigned to the Air Corps.

Similarly, the Artillery Corps established its own meteorological units and the Chemical Corps was assigned meteorological offices in connection with gas operations. Research and development, procurement and supply of meteorological equipment remained with the Signal Corps.

## Weather Services Set Centennial Activities

*(Continued from page 1)*

concern about shipping disasters on the Great Lakes due to storms led to Public Resolution No. 9, under which, on Feb. 9, 1870, the Secretary of War was directed to take meteorological observations and give warning of the approach of storms. This duty was assigned to the Army Chief Signal Officer Feb. 28, 1870.

That date, for computational purposes, marked the origin of the United States Weather Services. Later the civilian functions were transferred from the Army to the Department of Agriculture, and subsequently to the Department of Commerce. (See separate article, p. 8, for Army role.)

Today the Environmental Science Services Administration (ESSA), created in 1965, is a focal point for U.S. Government weather service to the general public. ESSA includes the U.S. Weather Bureau, the ESSA Re-

search Laboratories, the National Environmental Satellite Center, the Environmental Data Service, and the U.S. Coast and Geodetic Survey.

Joining in the centennial celebration are numerous federal and other agencies that have made major contributions to development of meteorology by the U.S. Weather Services.

Included among such agencies are the Department of Agriculture, the National Bureau of Standards, the Patent Office in the Department of Commerce, Department of Interior, Department of State, Federal Aviation Administration, Public Health Service, Atomic Energy Commission, National Science Foundation, Smithsonian Institution, National Aeronautics and Space Administration, and the Army, Navy and Air Force.

Presidential Science Adviser Dr.

*(Continued on page 10)*

## President Nixon Proclaims Centennial Month

On February 9, 1870, President Ulysses S. Grant approved a joint resolution of Congress (16 Stat. 369) providing for meteorological observations and for giving notice of the approach and force of storms.

In the hundred years which have intervened, meteorology and kindred atmospheric sciences have undergone phenomenal development through the skill, ingenuity, and dedication of civilian and military scientists, meteorologists, weather observers and many others serving on land, at sea, and in the air, in peace and in war. Their efforts have been aided through unswerving cooperation by the press and the radio and television industries.

This cooperation has resulted in weather services which touch almost every American life and which provide tremendous benefits in the protection of life and property, assistance to many facets of the national economy, and daily contributions to the public welfare and convenience.

Today, the United States is working diligently with many other nations toward a World Weather Watch which, through increased understanding and use of our environmental resources, will provide vastly improved weather services for the entire world.

NOW, THEREFORE, I, RICHARD NIXON, President of the United States of America, do hereby proclaim the month of February 1970, as United States Weather Services Month; and I urge our institutions and organizations, public and private, and our citizens, to recognize the achievements of the past century and to offer appropriate appreciation and support for this vital national function on the occasion of its centennial anniversary.

IN WITNESS WHEREOF, I have hereunto set my hand this 27th day of January, in the year of our Lord nineteen hundred and seventy, and of the Independence of the United States of America the one hundred and ninety-fourth.

/s/ RICHARD NIXON



# Weather Services Plan Centennial Activities

(Continued from page 9)

Lee A. DuBridge will speak at the centennial banquet Feb. 13 in the International Ballroom of the Washington Hilton Hotel.

Keynoter for the symposium is Dr. Robert M. White, ESSA administrator, who will speak on "A Century of Weather Progress." Other featured speakers include B. J. Mason, British Meteorological Office; Erik Mollo-Christensen, Massachusetts Institute of Technology (MIT); Edward N. Lorenz, MIT; and

Julian Bigelow, Institute for Advanced Study; V. E. Suomi, University of Wisconsin; Vincent E. Lally, National Center for Atmospheric Research; David Q. Wark, ESSA; John T. Middleton, National Air Pollution Control Administration; George A. Lincoln, Office of Emergency Preparedness; and

Donald P. Dunlop, Office of the Secretary of the Interior; George P. Cressman, ESSA-Weather Bureau; Thomas F. Malone, the Travelers Insurance Co.; Charles Pennypacker Smith, Pacific Gas Transmission Co.; Clifton von Kann, Air Transport Association; and

Paul M. Wolff, Naval Postgraduate

## STRATCOM Tests Multiplexer To Meet DCA Specifications

Successful testing of a compact 60-voice channel frequency division multiplexer, designed to meet Defense Communications Agency specifications, was announced recently by HQ Army Strategic Communications Command.

Capabilities of the new 540-pound unit equal or exceed those of existing equipment, although the unit weighs almost 90 percent less and occupies 13 square feet as opposed to 76 square feet for equipment it will replace.

Features of the AN/UCC-5(V), procured as an off-the-shelf item from the RCA Communications Systems Division, include solid-state design, switch selection of inverted or twin sideband modulation, standardized interchangeable channel modes, fast-acting group regulator, and expansion capability up to 600 channels.

A built-in test facility permits the operator to monitor equipment status without channel degradation. The light weight and small size of the new unit make it ideal for long-haul and transportable line-of-sight and tropospheric scatter communications applications, STRATCOM reports.

School; David M. Gates, Missouri Botanical Garden; William C. Ackermann, Illinois State Water Survey; Roger Revelle, Harvard University; Frederick Sargent II, University of Wisconsin; E. G. Bowen, Division of Radiophysics, Australia; Joanne Simpson, ESSA; and Syukuro Manabe, ESSA.

Session chairmen for the symposium will include Bernhard Haurwitz,

## AVLABS Contract Extends Quiet Helicopter Program

Contracts for development of quiet helicopters awarded by the U.S. Army Aviation Materiel Laboratories (AVLABS), Fort Eustis, Va., reached a total of \$1,116,881 with a recent award for \$319,000.

Kaman Aircraft received the contract for a 10-month extension of participation in the Quiet Helicopter Program, involving aircraft used by the Army, Air Force and the Navy. Kaman has now received contracts for \$497,756 to quiet the Air Force HH-43B Huskie helicopter.

AVLABS contracts also have been awarded to Sikorsky Aircraft in the amount of \$375,000 to quiet the Navy's 3H-3A Sea King helicopter and to Hughes Tool Co. for \$244,125 to quiet the Army's OH-6A Cayuse helicopter.

AVLABS exercised technical and administrative over-all responsibility for supervising the R&D work to reduce the noise level of aircraft used for the Quiet Helicopter Program (QHP). This effort is sponsored by the Advanced Research Projects Agency (ARPA), Office of the Director of Defense Research and Engineering.

The Acoustics Branch, Dynamic Loads Division, NASA-Langley Re-

National Center for Atmospheric Research; Morris Neiburger, University of California (Los Angeles); Horace R. Byers, University of Texas; and

Francis W. Reichelderfer, former chief, U.S. Weather Bureau; Sverre Petterssen, London, England; Patrick D. McTaggart-Cowan, executive director, Science Council of Canada; Louis J. Battan, University of Arizona; Henry G. Houghton, MIT; and Philip D. Thompson, National Center for Atmospheric Research.

search Center, Hampton, Va., will actively participate in the latest contract, as it has done on earlier QHP activities.

## DCS Support Systems Discussed At Tri-Service Logistics Parley

Problem areas involved in support of the Defense Communications System (DCS) were discussed at the recent Tri-Service DCS Logistics Support Conference in Washington, D.C.

Sponsored by the U.S. Army Strategic Communications Command (STRATCOM), the meeting was attended by some 40 military and civilian personnel from the Army, Navy and Air Force.

Conference chairman Gerald O. Peters, STRATCOM deputy assistant chief of staff for Logistics said participants termed the 3-day session one of the most productive planning meetings conducted by the joint body.

Discussions were concerned with many of the topics considered at a worldwide Army communications logistics support meeting held last October to coordinate joint service positions with the Defense Communications Agency at a future date.

## Col Wamsted Takes Command of SATCOM Agency

Col Leland D. Wamsted recently became commander of the U.S. Army Satellite Communications (SATCOM) Agency, Fort Monmouth, N.J., when Col George E. Rippey was assigned to the U.S. Army Strategic Communications Command (STRATCOM), Fort Huachuca, Ariz.



Col Leland D. Wamsted

Col Wamsted was assigned to SATCOM in August 1967 and became deputy commander in April 1968. Prior agency assignments include duty as director of Control and Evaluation and director of Programs.

Until assigned to SATCOM, he was senior signal adviser to the Turkish First Army. He has served with the U.S. Army Electronics Proving Ground Test and Evaluation Command Activity, Fort Huachuca, Ariz.; U.S. Army Alaska Communications System, Juneau, Alaska; the Signal School at Fort Monmouth; the Long Lines Radio Systems in Japan; and in the Philippines and Korea.

Col Wamsted holds a BS degree from the University of Omaha (1963) and an MS degree from the University of Arizona (1965).



## ISO Announces Realignment, Personnel Assignments

In accordance with realignments effected by General Orders No. 10, Office of the Chief of Research and Development, HQ DA, Nov. 17, personnel reassignments in the Information Systems Office were announced effective Dec. 15.

Morton H. Marks, deputy chief of the ISO under Col Dale L. Vincent since its inception in mid-1969, is now also deputy director of the U.S. Army R&D Information Systems Office, which is a Class II activity reporting to the ISO. The Class II activity is collocated with the Army Research

Office in the Highland Bldg., Arlington, Va.

The Class II activity has two divisions. The Data Management Division, headed by Martin H. Weik Jr., has three newly aligned branches. Dr. John C. Hayes is chief, Technical Information Branch, Robert F. Chaillet is chief, Information Technology Branch and Clarence T. Smith is chief, Publications Branch.

David Nemore is newly assigned as chief, Management Information Division, and Richard M. Whitaker is chief, Systems Design and Develop-

ment Branch. Lt Col Francis W. Matthews continues as chief, Systems Operations and Maintenance Branch.

Homer Hart, Mrs. Jean Lane and Mrs. Rosemary West Mrs. Hattie H. Bass, formerly with the ISO at HQ DA, are now assigned to the Office of the Director of the Class II activity.

## MERDC Slates February Tests Of Airborne Fire-Fighting Unit

An airborne fire-fighting system for helicopter crash fires is scheduled for tests in February by the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

Operated from a hovering helicopter, the system foams down the fire to open a rescue path to the crash. Designed to maintain a safe 15 to 20 foot rescue path for two to five minutes through burning spills of up to 500 gallons of aviation fuel, the system permits aeromedical rescue teams to remove individuals trapped in the burning craft.

The spray release boom is fireproof and can be adjusted to take advantage of the rotor downwash to spread the foam from two 25-gallon tanks.

The system is operated by a control on the helicopter pilot's cyclic stick. It weighs about 600 pounds, including communication equipment and fire-protective clothing. In a secondary application, it may be used for chemical, biological and radiological decontamination of aircraft and personnel.

## AMC Assigns Product Manager-Rifles to WECOM

The first product manager stationed at HQ U.S. Army Weapons Command, Rock Island, Ill., is Lt Col Rex D. Wing, who reported for duty in mid-January and is listed for promotion to colonel.

In his capacity of product manager, Rifles, he has been delegated full authority by the commanding general, U.S. Army Materiel Command (AMC), for the planning, directing and controlling of the allocation and utilization of all resources committed to this program. He is supported by functional organizations within the U.S. Army Weapons Command, and AMC elements.

Col Wing is a graduate from the

University of Nebraska and in 1969 was graduated from Babson College with a master of business administration degree "With high distinction."

His military education includes completion of the Engineer Officer Basic Course, the Engineer Officer Advanced Course, the Command and General Staff College and the Army Management School Course.

During the Korean War, he served with the 76th Engineer Battalion, and in 1965-66 was a plans officer in HQ Military Assistance Command Vietnam.

His decorations include the Legion of Merit, Korean Service Medal with seven service stars, and the Vietnam Service Medal with three service stars.

## ECOM Patent Agency Reports On Application, Disclosures

Technical advances in electron tube and devices research are reported in one patent application and five disclosures being processed by the U.S. Army Communications Command's Patent Agency, Fort Monmouth, N.J.

The 3-man team in the Electronic Components Laboratory is comprised of Louis E. Branovich (leader), Martin L. Long Jr. and William B. P. Fitzpatrick. All the disclosures are on preparation of chemical vapor deposition, involving coating a hot substrate, or base material, by gas-liquid reactions.

The patent application has been filed on "Preparation of Chemical Vapor Deposited Isotropic Boron Nitride from Anisotropic Boron Nitride."

Disclosures are titled "Preparation of Chemical Vapor Deposited Isotropic Boron Nitride"; "A Preparation of Isotropic Boron Nitride"; "Preparation of CVD Isotropic Boron Nitride Using Boron Nitride Powder, Boron Nitride Fibers, etc."; "Preparation of CVD Isotropic Boron Nitride Using Barazole, Methanol and Ammonia" and "Acceleration in Deposition of CVD Isotropic BN Using Ammonia and Trimethoxyboroxide."



ACCEPTING TITLE for 136.68 acres of former U.S. Naval Ordnance Laboratory (NOL) land for relocation of the U.S. Army's Harry Diamond Laboratories (HDL) from Washington, D.C., to White Oak, Md., are Lt Col Peter E. Hexner (right), HDL commander, and Col William J. Love, district engineer for the Baltimore District, Corps of Engineers. Standing (from left) are Roy L. Porterfield, chief of the Relocation Planning Office; Billy M. Horton, HDL technical director; and Joseph H. Campagna, HDL associate director for Administration. HDL operations currently represent a \$25 to \$30 million annual expenditure involving activities of some 1,400 scientists, engineers, technicians and laboratory assistants. The proposed move, still five or more years away, is expected to be a multimillion-dollar project, including construction of buildings.



# Resor Approves Nomination of 6 Army Employees for DoD DCSA

Secretary of the Army Stanley R. Resor has approved nomination of six Army career service employees, four in research and development assignments, for Department of Defense Distinguished Civilian Service Awards.

Announced in mid-January, the nominees are Dr. Harry P. Kalmus, chief scientist, Harry Diamond Laboratories; Mrs. Mary V. Klicka, ration design specialist, Army Natick (Mass.) Laboratories; Dr. William C. Manion and Dr. Fathollah K. Mostofi, Armed Forces Institute of Pathology; D. Kenneth Chacey and Roland L. Guyotte Jr., Military Traffic Management and Terminal Service.

Dr. Kalmus is one of the Army's most honored scientists for outstanding achievements in guided missile systems target detection and discrimination, range-finders, radars and other research fields.

Among his 25 patents on inventions is a "doppler direction indicator," used to determine the magnitude and velocity of a target for interception. Applied to antiintrusion radars, this has proved highly effective in clutter suppression to detect targets.

Elected as a Fellow of the Institute of Radio Engineers in 1956, Dr. Kalmus was awarded a Secretary of the Army Research and Study (SARS) Fellowship in 1965. Among his honors are the U.S. Department of Commerce Gold Medal for Exceptional Service (1954) and the Department of the Army Decoration for Exceptional Civilian Service (1961).

Dr. Kalmus received his doctorate and earlier degrees from Vienna (Austria) Technical University. He joined the National Bureau of Standards research staff in 1948 and was in the group of NBS scientists transferred to the Army with establishment of the Diamond Ordnance Fuze Laboratories (now HDL) in 1953.

MRS. M. V. KLICKA received the Army's highest award for civil service employees, the Decoration for Exceptional Civilian Service, at the Second Annual Ladies' Day Awards Ceremony in 1968, in recognition of outstanding service to the Armed Forces since 1947.

During the past 12 years she has been responsible for the planning and design of operational, survival and special rations for the Armed Forces. Since 1961, when the manned space flight program was launched, she has been responsible for developing menus and for coordinating the development and production of food for the astronauts on their flights. Currently she is



Dr. William C. Manion



Dr. Fathollah K. Mostofi



Dr. Harry P. Kalmus



Mrs. Mary Klicka



Roland L. Guyotte Jr.



D. Kenneth Chacey

working on advanced feeding concepts for the Apollo Applications Program (Saturn IVB).

Mrs. Klicka received a BS degree from the University of Washington in 1944 and a master's from the University of Chicago in 1947.

DR. W. C. MANION is internationally renowned as a cardiovascular pathologist and has been in a research supervisory position with the Armed Forces Institute of Pathology, Washington, D.C., since 1953.

The citation accompanying his nomination for the DoD Distinguished Civilian Service Award points to many demands made upon him by other U.S. Government agencies to serve as a consultant, also stating:

"... Cardiologists and pathologists from medical institutions throughout the world attend the courses in cardiovascular pathology conducted by him. His activities in his specialty have a definite and positive impact in improving the quality of life in civilian communities."

Dr. Manion has amassed numerous high honors, including the American Medical Association (AMA) Certificate of Merit (1957), American Society of Clinical Pathologists (ASCP) Gold Award (1959), AMA Silver Hektoen Medal (1964) and ASCP Silver Award (1965).

He received a BS degree from Cath-

olic University of Washington, D.C., MD degree from Georgetown University School of Medicine, and pursued special studies in 1946-47 at George Washington School of Medicine.

DR. F. K. MOSTOFI received the Department of the Army Decoration for Exceptional Civilian Service in 1966, in recognition of his international reputation as an authority in genitourinary pathology. The citation for the DoD DCSA states, in part:

"... His research and teachings have a definite impact in improving the quality of life in civilian communities. . . . Urologists and pathologists from Korea, Argentina, Italy, Australia, Iran and Brazil have received their training with him. In the new medical specialty of aviation pathology, he was responsible for many well-accepted conclusions on the importance of certain human factors which affect aircraft crews."

Dr. Mostofi was awarded AB and BS degrees by the University of Nebraska and received his doctorate from Harvard University Medical School. He served internship and residencies at St. Luke's Hospital, Bethlehem, Pa.; Peter Bent Brigham Hospital, Boston, Mass.; Boston Lying-In Hospital and Free Hospital for Women, Boston, Mass.; and Children's Hospital, Boston.

D. KENNETH CHACEY, an Army



nominee for a Rockefeller Public Service Award in 1966, received a National Civil Service League Merit Citation in 1958, and the Decoration for Exceptional Civilian Service in 1958. He has received two Meritorious Civilian Service Awards (1965-66) and two Sustained Superior Performance Awards.

He is a veteran of 28 years with the U.S. Government and is currently special assistant for transportation engineering, Military Traffic Management and Terminal Service, Washington, D.C. He is a member of the Highway Research Board of the National Academy of Sciences, and a charter member of the National Defense Transportation Association.

The nomination for a DoD DCSA credits him with "significant contributions to Assure that the nation's highways best serve the needs of national defense. The standards to which the National System of Interstate and Defense Highways are being constructed incorporate specific defense requirements. Mr. Chacey not only determined standards required to meet de-

fense needs, but almost single-handed got the standards adopted by the States and approved by the Bureau of Public Roads."

He was educated at Ohio State University (BSCE degree) and at the University of Tennessee.

R. L. GUYOTTE JR. began his career as a civil service employee in the early 1940s with the War Department Commercial Traffic Division. Currently he is executive assistant and senior transportation adviser to the Military Traffic Management and Terminal Service (MTMTS).

Railroading is ingrained in his blood, so to speak, going back through 13 members of his family to his great grandfather. He has served every commander of the Military Traffic Management Agency and the Defense Traffic Management Service, both forerunners to the MTMTS.

Twice honored with the Army Decoration for Exceptional Civilian Service (1961 and 1967), he is credited, in the nomination for the DoD DCSA, with contributing significantly to the planning and establishment of the

MTMTS as a jointly staffed single manager operating agency.

The citation also acclaims him for "continued improvement" in the overall logistical responsiveness of the MTMTS, as well as effective liaison with outside agencies and carrier associations. His work "resulted in the development and launching of the Automated System for Transportation Data (AUTOSTRAD)."

## STRATCOM Announces Plans For ACAMPS Acceptance Tests

Acceptance testing of a communication system to reduce significantly manual routing and distribution of messages is scheduled early this year at HQ U.S. Army-Pacific, Fort Shafter, Hawaii, the Army Strategic Communications Command has announced.

ACAMPS (Automated Communications and Message Processing System) is designed to accept punched card and perforated tape messages, and to change the message format to meet transmission specifications automatically, STRATCOM reports.

Tests are in charge of Daniel R. Prado, a computer specialist in the STRATCOM Test and Evaluation Directorate. He said ACAMPS is the first step in eliminating manual handling and retransmission of messages.

The system consists of central processors, cathode ray entry display stations, disc files and line printers, featuring magnetic tape storage, message rejection/correction capability, and fast retrieval. Control Data Corp. is the contractor.

## 1664th Mob Des R&D Detachment Slates Meet at MERDC, Aug. 2-15

High-ranking military and civilian leaders are programmed for presentations at the 12th annual Research and Development Symposium for Reserve Officers, Aug. 2-15, U.S. Army Mobility Equipment R&D Center (MERDC), Fort Belvoir, Va. The theme is "Engineering Development for the 70s, Research for the 80s."

Hosts for this meeting since its inception have been the members of the 1664th Mobilization Designation Detachment, headed by Col A. H. Humphreys. Lt Col Trelyon W. O'Connor Jr. and Lt Col Herbert W. Maas, MERDC civilian employees, will serve as director and deputy director.

Inquiries regarding the symposium, which serves to update participants in knowledge of recent R&D progress, problems, ongoing programs and foreseeable objectives, should be addressed to Lt Col O'Connor, 1664th Des Det (R&D), ATTN: SMEFE-USAR, U.S. Army Mobility Equipment R&D Center, Fort Belvoir, Va. 22060.

## Graham Succeeds White as Commander of MUCOM

Brig Gen Erwin M. Graham Jr., CG of the Army Ammunition Procurement and Supply Agency (APSA) at Joliet, Ill., will head the U.S. Army Munitions Command (MUCOM) in February. He succeeds Maj Gen Frank G. White, who will retire Jan. 21 after 32 years of Army service.

Listed for promotion to major general, Graham served as commandant of the U.S. Army Missile and Munitions Center School from July 1965 until 1967. He then commanded the Aberdeen (Md.) Ordnance Center and School until June 1968, when he was assigned to APSA.

General Graham earned a BS degree in electrical engineering from Mississippi State University in 1938 and received MS and PhD degrees in electrical engineering from Massachusetts Institute of Technology in 1950. He is a graduate of the Command and General Staff College, the Armed Forces Staff College, and the Naval War College.

From 1953 through 1956, he served in Norway and France with Army ordnance activities and was in Korea with the 74th Ordnance Battalion and later the 7th Logistical Command (1961-62).

Earlier assignments include service in Algeria, France and at Redstone Arsenal, Ala., where he established what is now the U.S. Army Missile and Munitions Center and School.

His service decorations include the

Bronze Star Medal, Commendation Medal with Oak Leaf Cluster, European-African-Middle East Campaign Medal and Croix de Guerre (France).

Working through four commodity centers and APSA, MUCOM is responsible for nuclear and conventional munitions, rocket and missile warhead sections, propellants, propellant-actuated devices, and chemical and biological material.

MUCOM has jurisdiction over Edgewood Arsenal, Md.; Fort Detrick, Md.; Frankford Arsenal, Philadelphia, Pa.; Picatinny Arsenal, Dover, N.J.; Pine Bluff Arsenal, Ark.; Rocky Mountain Arsenal, Denver, Colo.; and APSA.



Brig Gen E. M. Graham Jr.



# Army Agencies Report on Mine-Countermine Research Results

Status reports on barrier-counter-barrier (mine-countermine) research, emphasized during the past year in response to requirements for improved land combat capabilities, were presented Dec. 17-18 at an Army-wide Coordinating Conference.

Director of Army Research Brig Gen George M. Snead Jr. gave the welcoming address at the conference in Army Research Office HQ in the Highland Building, Arlington, Va. Representatives from 15 Army laboratories and agencies participated.

Twenty-eight technical papers reported on research results during the past year. Presentations were made by personnel of the Army Materiel Command, Combat Developments Command, CDC Institute for Land Combat, Office of the Chief of Engineers, Test and Evaluation Command, Army Land Warfare Laboratory (formerly Limited War Laboratory, redesignated Jan. 16), Cold Regions Research and Engineering Laboratory (CRREL), Electronics Command, Weapons Command, Edgewood Arsenal, Picatinny Arsenal, Frankford Arsenal, and Mobility Equipment R&D Center.

Requirements were explained for future tactical barrier systems, doctrine and capabilities for countering present threats in Southeast Asia and Europe. Among objectives outlined were improved mobility, reduced barrier deployment time, improved physical obstacles, and capabilities for activating or deactivating barriers.

Scientific and Deputy Director of Army Research Dr. Richard A. Weiss gave the keynote address, titled "The One-Hundredth Blow." Dr. Weiss pointed out that what is termed a "scientific breakthrough" in most instances is an accumulation of results

## IEEE Elects HDL Man as Fellow

Technical achievement that earned Harry Diamond Laboratories' researcher Howard S. Jones Jr. a Special Act Award, reported in the March 1969 *Army R&D Newsmagazine*, has also made him a newly elected IEEE Fellow.

The Institute of Electrical and Electronic Engineers will honor the Army Materiel Command scientist at a banquet in New York City in March when other 1970 IEEE Fellows will be cited at an international meeting.

Jones is an HDL senior research supervisor. The IEEE has recognized his development of techniques for producing microwave antennas and related components for missiles and spacecraft. He has authored more than 30 technical papers and is the inventor or coinventor on 15 patents.

of a number of steps of progress which in themselves are not recognized as significant until applied.

In making this point, Dr. Weiss said that Army research on barriers and counterbarriers since 1955 has produced many results contributory to understanding of the scope of the over-all problem—but that the "one-hundredth blow" to a breakthrough remains to be struck.

In spite of the quantities of data that have been collected and the numerous concepts proposed, examined, rejected, screened and modified, he said, the casual observer may tend to believe no real progress has been made. However, he said, those working on the problem know that the big encouraging gains collectively will yield an eventual solution.

Ongoing projects to meet barrier-counterbarrier requirements were described by Martin Damgaard, project officer at HQ Army Materiel Command, and by Manfred Gale, associate technical director, Mobility Equipment R&D Center. The MERDC has the primary R&D program responsibility.

Expansion of barrier-counterbarrier research programs and the desire of the Army to use in-house research capabilities when possible have brought a number of new laboratories into studies of this difficult problem area.

A Barrier-Counterbarrier Research Coupling and Coordination Office was

established recently at Frankford Arsenal, Philadelphia, Pa., as a center for interface of research activities. Dr. William McNeill, chief, of this office, described activities for coordination at the working level.

Other reports were made by multidisciplinary interagency working groups that have been organized to address specific problems, such as threat definition and barrier effects. Dr. Joseph A. Lannon of Frankford Arsenal reported on work to develop olfactory and molecular sensing approaches for mine detection. C. W. Fleischer of the same installation reported on threat studies.

Dr. Paul Murmann of CRREL told of research on mine and tunnel detection by trace gas analysis. Dr. Paul Strauss of the Human Factors Group at Picatinny Arsenal detailed needs for study of behavior patterns of an aggressor meeting a barrier, as an approach to determining new ways of influencing them. John W. Walker, ECOM, discussed electromagnetic properties of soil and barrier problems.

Countermine problems from the viewpoint of a squadron commander were discussed informally by Col Merritts Ireland, HQ Army Materiel Command, at a luncheon session. Col Ireland spoke on the basis of experience gained during a recently completed tour of duty in Vietnam.

## Col Ray's Key Role Illustrates AE Program Payoff



Col Roger Ray

has a liaison function with the AEC Division of Military Application.

Col Ray entered the Atomic Energy Officer Program as a career specialty field when assigned as a staff officer, Los Alamos Scientific Laboratory (1953-57). He conducted diagnostic work on test operations CASTLE, PLUMB, REDWING, 56 Project, and TEAPOT.

In 1957-58 he was AFSWP program director for the first U.S. high-altitude nuclear detonations (Operation HARDTACK), then became director, Picatinny Arsenal Research Laboratories.

When atmospheric nuclear testing was resumed in 1962, he was reassigned from the National Aeronautics and Space Administration to become deputy to the scientific director, Joint Task Force Eight.

Col Ray is a 1943 graduate from the U.S. Military Academy, has a 1948 New York University ME in aeronautical engineering and is a Command and General Staff College, and Industrial College of the Armed Forces graduate.

Opportunities for advancement to major assignments by participating in the Atomic Energy Officer Program are illustrated by Col Roger Ray, until last July commander of Picatinny Arsenal, Dover, N.J.

Col Ray's current assignment is deputy assistant to the Secretary of Defense for Atomic Energy. He has a secondary duty as executive secretary, Military Liaison Committee to the Atomic Energy Commission.

In the first position Col Ray assists in formulating policy and in the management of atomic energy matters throughout the Department of Defense. As MLC executive secretary, he supervises operation of the AEC Secretariat at HQ AEC, Germantown, Md., and



## Army Seeks to Halt Early Detonation During Flight

Raincaps for artillery shells, so sensitive they have detonated prematurely in hard-driving rain in Southeast Asia, have been developed by Army Materiel Command engineers at Frankford Arsenal, in response to immediate remedial action demands.

The raincap, a protective device fashioned of polyurethane, acts as a shock absorber to cushion the impact of raindrops on the nose tip of the artillery shell. Detonation due to this impingement frequently has occurred

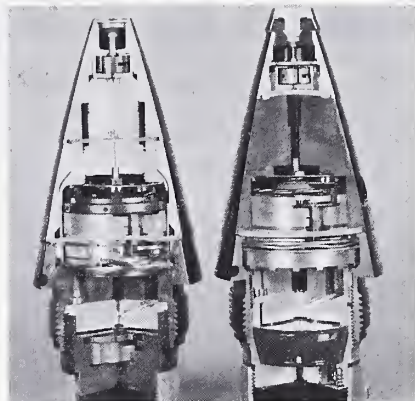
during the projectile's flight in tropical storms in Southeast Asia.

Engineers in the Timing Devices Laboratory at the Frankford Arsenal Research and Engineering Center turned to polyurethane based on Air Force testing of this material on the leading edge of helicopter blades. Research was performed at Wright-Patterson Air Force Base in Ohio.

The raincap is itself protected by a stainless steel sleeve to prevent rain erosion. One of the major problems encountered in initial research was the difficulty in avoiding over-protection, so as not to destroy the projectile's target sensitivity.

Extensive testing at Holloman Air Force Base, using sleds with special fuze mountings, has been carried out in simulated tropical rain at speeds far exceeding actual firing velocities. Initial testing has proved the raincap meets all requirements.

Some fuzes have been propelled on



RAINCAP, developed at Frankford Arsenal to prevent premature detonation of artillery shells, is shown at tip of M564E2 fuze at right. M564 fuze, without raincap, is shown at left.

the high-velocity sleds up to 10 times through severe simulated rain with no incidence of premature functioning of the detonating element. The same rounds functioned on ½-inch plywood targets following the tests.

## AVSCOM Installs Links To Communication System

In line with Army Materiel Command expansion of computer and data processing capabilities, the Aviation Systems Command (AVSCOM) has installed a page reader computer system at headquarters, St. Louis, Mo.

The Control Data 915-1700 system will provide intermilitary services communications and will be tested for suitability for other AMC areas. The AMC has seven commodity commands and operates supply depots in the United States and overseas.

In the AVSCOM system, typewritten messages are scanned by the page reader and fed into the computer for editing, formatting and checking. The message is reproduced on paper tape and transmitted to teletypewriters at designated military and U.S. Government agency locations.

Projected upgrading of the system will send messages directly from the computer to addressees, bypassing the paper tape operation. The system will interface with AUTODIN, the automatic communications network used by the military services and the government.

## Col Wallis Reports to MICOM As Personnel, Training Officer

Col Vernon V. Wallis, an Infantry officer with a bachelor's degree in business and social sciences from Utah University and a master's degree in mechanical engineering from the University of Arizona, is the new chief of the U.S. Army Missile Command Personnel and Training Office.

Col Wallis entered the Army in 1946 and has served in Europe and the Far East. He earned a Legion of Merit while serving with the U.S. Army Combat Developments Command Institute of Nuclear Studies, the Bronze Star for valor with the 5th Regimental Combat Team in Korea, and an Army Commendation Medal in Thailand.

## New HDL Museum Traces Development of Fuzes

Fuzes touch off the boom and destructive power of explosives that help to win wars as well as to serve many civilian construction requirements, and the U.S. Army's Harry Diamond Laboratories are known worldwide for development of fuzes—which explains the creation of HDL's new fuze museum.

Approximately 500 fuze items have been collected and catalogued for the museum as a starter. HDL officials expect the collection will grow rapidly as a source of information valuable to fuze designers, as well as a visible record of R&D progress.

The oldest item in the collection predates the Harry Diamond Laboratories, established in 1953 with a nucleus of scientists and engineers from the National Bureau of Standards.

This 1941 bomb fuze was developed by Wilbur S. Hinman Jr., who became the first HDL technical director and was later Deputy Assistant Secretary of the Army (R&D) until he retired in 1963 to end 35 years of distinguished civilian service to the U.S. Government.

Another HDL retiree, Morris Brenner, was called back to duty under contract to set up the fuze museum. The collection is organized into categories such as fuzes for bombs, rockets, mortars and artillery. Further classification includes mechanical, electromechanical, photoelectric, guided missile fuzes, power supplies, safety and arming mechanisms, etc.

Included in the display as it is developed will be such wide-range items as pulse radar and fluoric devices (fluid or gas amplification controls) developed at the Harry Diamond Laboratories. HDL's contributions to medical life-support and life-saving devices (such as the Army heart pump), and a long list of electronic and other innovations, also will be displayed.

Consequently, though it will be known as the Fuze Museum, the exhibit will give visitors a rather comprehensive view (except for a great many classified items) of HDL's research and development contributions to military as well as civilian needs.



FUZE EXPERT Morris Brenner was called back to duty under contract to set up a new fuze museum at the U.S. Army Harry Diamond Laboratories.



# Watervliet Sets Up Electron Analyzer Facility

Conversion of a Watervliet Arsenal building erected in 1829 is providing a modern research facility that will have as its major instrument a scanning electron microprobe analyzer.

The analyzer, in which a focused beam of electrons is made to interact with a specimen surface, will be used to detect and/or quantitatively measure all elements from boron through uranium which may be present.

Research chemist Joseph F. Cox, in charge of the new facility, says the resulting X-ray spectrum contains data on almost all elements in the specimen. By synchronously scanning the analyzer electron beam with the beam in a cathode ray tube, researchers will be able to obtain an image of the 2-dimensional distribution of chemical elements on the surface being examined.

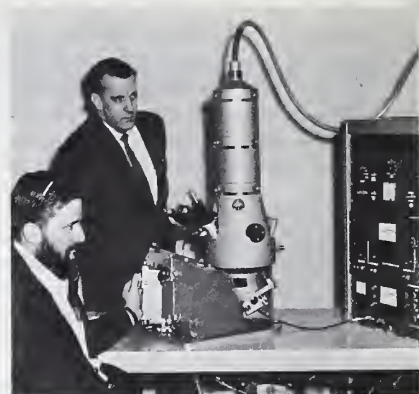
The equipment images other signals

such as specimen current, back-scattered electron intensity and secondary electron intensity. By combining signals, researchers will be able to obtain a great deal of detailed information about the specimen surface under investigation.

Originally used for ammunition storage, the building being remodeled is particularly suited for its new role because 4-foot-thick walls will provide substantial shielding for the high levels of radiation associated with use of equipment.

Eventually the lab will house other instruments for activation or excitation analysis. Cox and his associates are considering instruments for neutron activation analysis, photon activation analysis and electron excitation analysis.

This type of instrumentation, combined with the electron microprobe analyzer, will provide a powerful facility for detailed investigations of fatigue, fracture, phase separation, alloy het-



**WATERVLIET ARSENAL** research chemists Joseph F. Cox and William J. Herrernam adjust spectrometer for the arsenal's electron microprobe analyzer to detect and measure level of various elements in a material specimen.

erogeneity, erosion and corrosion of various weapon components (particularly gun tubes and breech mechanisms), and many other areas of interest to the U.S. Army.

## Canadian DRB Discloses Major Gas Laser Advance

Gas laser research scientists of the Defence Research Board of Canada are claiming a "radically new technique to excite the CO<sub>2</sub>-N<sub>2</sub> mix at atmospheric pressure, overcoming drawbacks of conventional gas lasers.

"Whole new fields of application, from improved radars to tunneling in rock," appear feasible in view of greatly reduced cost (said to be about one-tenth of comparable conventional lasers) and the great increase in power (100 to 1,000 times more for equal length), the Canadian Defence Research Board claims.

Termed TEAL (Transversely Excited Atmospheric Laser), the invention has been patented in the U.S., Britain and a number of other countries.

Easy to construct and operate, the system in extensive testing has produced an average power output of hundreds of watts at p.r.f. of 1,000 pulses/second in a 5-foot laser. Twenty-five megawatts of peak power was obtained at 18 percent efficiency in a 3-foot tubular device.

The announcement said that Canadian Defence Research Board scientists are "pressing ahead with the development of advanced TEA lasers, with hopes of reaching 10 kilowatts of average power and 1,000-joule pulses in the near future."

Extensive gas laser and other laser research is being conducted by the United States Army and Air Force, as well as by the academic and industrial scientific community.

## Picatinny Selects Dr. Sharkoff as Director of ESL

Qualifications of Dr. Eugene Gibb Sharkoff for his new duties as director, Engineering Sciences Laboratory, Feltman Research Laboratories, Picatinny Arsenal, Dover, N.J., include notable achievements as a soldier, scientist and educator.

Well-known to the Army research and development community through long association, Dr. Sharkoff has a BS degree from the U.S. Military Academy along with MS and PhD degrees from Massachusetts Institute of Technology.

When former Director of Army Research Maj Gen Chester W. Clark (USA, Ret) was director of the Feltman Research Engineering Laboratories, Dr. Sharkoff was his technical assistant. Dr. Sharkoff also served as associate professor of physics, U.S. Air Force Institute of Technology.

Prior to his recent transfer to Picatinny Arsenal, Dr. Sharkoff was program director for the U.S. Army Avionics research program conducted by Princeton and Pennsylvania Universities under contract. One of the papers he coauthored is "Electrostatic Charging and Discharging Phenomena of Helicopters in Flight."

In his Picatinny Arsenal assignment, he intends to continue long-sustained research on contact charge mechanisms on a part-time basis. He has managed Army R&D programs at various levels in aeroballistics, ordnance and across the range of Army Materiel Command interest.

The FRL's Engineering Sciences Laboratory is staffed with 118 employees, eight of whom have PhD degrees, 29 with MS degrees and many others who are pursuing advanced education at local universities in fields nearly as diverse as the laboratory's mission.

Dr. Sharkoff is a member of the American Association of Physics Teachers; American Helicopter Society; Institute of Electrical and Electronic Engineers; New York Academy of Sciences; American Institute of Aeronautics and Astronautics, and Sigma Xi and Tau Beta Pi.



**ENGINEERING SCIENCES** Laboratory Director, Dr. Eugene Gibb Sharkoff, explains oscillograph details to U.S. Military Academy cadets during their recent visit to Picatinny Arsenal.



# Survey Confirms Value of Research Results in Social Sciences

Responses to a questionnaire addressed to users of reports prepared by the Center for Research in Social Systems (CRESS) attest strongly to the value of results of the U.S. Army social science research program.

The survey, conducted as the first systematic Army-wide interrogatory on the practical application of social science research results to military operations, asked for viewpoints on four basic questions:

- Who in the Army uses CRESS research?
- How much use is made of CRESS research?

## AIDAS Installation Serves USAASTA at Edwards AFB

Installation of an Advanced Instrumentation and Data Analysis System (AIDAS) to serve the U.S. Army Aviation Systems Test Activity (USAASTA) at Edwards Air Force Base, Calif., was ordered in a recent contract.

AIDAS is described as a vast system, including airborne recording on magnetic tape as well as telemetry to remote ground stations, for real-time flight safety and data monitoring.

In the conduct of engineering flight testing, the USAASTA explained, the service that AIDAS will provide is essential to effective operations. The installation will be part of a modernization program in data collection and analysis.

Real-time information provided by the system, which provides in-flight recording on magnetic tape and drastically reduces the number of hand operations for final data reduction, will minimize the time required for preparation of test reports.

Under the system AIDAS will supplant, aircraft had to return from flight tests, oscillograph test tapes had to be removed, and the data reduced by numerous means before it could be determined if the data was accurate and adequate.

Acquisition and implementation of AIDAS will span a 3-year period, with the first arrival of equipment at the USAASTA programed for May or June 1970. Remote ground stations, used to obtain data from below sea level to elevations of 11,000 feet, will be completely self-contained in mobile vans.

The central ground station, equipped with telemetry receivers and graph plotting devices, will use a third-generation general computer for data reduction. Designed to replace an IBM system, AIDAS was developed by the Electro-Mechanical Research Corp.

- What kinds of uses are made?
- What value do the users attach to CRESS research?

Chief of Research and Development Lt Gen A. W. Betts, in a letter transmitting results of the survey, commented that the response of users confirms belief in the worth and in the mission orientation of the Army social science program.

Mailed directly to users, questionnaires solicited only voluntary response but asked for negative replies on usage, limited to FY 1968 and 1969. Eighty-nine users of CRESS materiel were identified among 101 respondents to the 120 questionnaires.

Nine out of 10 users rated CRESS research as "excellent" or "above average" (51 and 38 percent, respectively). Nearly two-thirds described it as either necessary or useful to mission accomplishment. Representative of a cross-section of the Army, users ranged from operational civil affairs units in Vietnam through the Command and General Staff College, major commands and the Army General and Special Staffs.

The percentage of usage reported in replies ranged from a low of 76 percent among Army Reserve units to a high of 100 percent among respondents assigned to major command headquarters.

Combat developments agencies reported 93 percent usage among the 94 percent of those who responded to the questionnaire. Academies, schools and training centers reported 92 percent usage among 86 percent of addressees responding to the survey. Numbered commands claimed 88 percent users among the 89 percent of addressees who answered the questionnaire. Us-

age at HQ DA staff level was 83 percent.

Relative to the degree of usage, 27 percent of all respondents to the survey said they used 20 or more CRESS documents annually. Six percent used 15 to 19 reports, 15 percent were in the 10 to 14 bracket, 17 percent were served by 5 to 9 documents, and 22 percent used 1 to 4 reports. Among the 101 respondents, 12 percent used no CRESS research results.

In response to a question about rated effects of discontinuing CRESS reports, 55 percent of respondents thought such action "would deprive the organization of many useful documents."

Twenty-four percent responded "would result in a loss of interesting information." Sixty-three percent termed the reports necessary or useful to mission accomplishment.

"Coupling," that is, the application of new knowledge to a military requirement, required far less time in the "soft" social sciences than in the coupling of discoveries in the "hard" sciences to materiel requirements, the survey on CRESS usage shows.

In many instances, it is emphasized by the survey findings, the contents of a technical report on the social sciences investigations may be translated almost immediately into training materials, plans or doctrine.

Army officials monitoring the CRESS program, funded at about \$2 million annually, conceded that there may be Army units who should be using results of social science research, but are unaware of benefits.

Results of the survey are expected to broaden usage of social sciences technical reports.

## Dr. Mounter Heads FSTC Basic Science Division

Appointment of Dr. L. A. Mounter to head the Basic Science Division, U.S. Army Foreign Science and Technology Center, Washington, D.C., was announced recently through HQ U.S. Army Materiel Command.

Dr. Mounter is a native of London, England, was graduated from Oxford University with honors in chemistry and continued studies to earn his doctorate in biochemistry.

From 1963 to 1966, when he became head of Chemical Programs, Naval Weapons Laboratory, Dahlgren, Pa., Dr. Mounter was employed by the Army at Edgewood (Md.) Arsenal. After serving as staff assistant to the head of the NWL Advanced Systems Department, he was detailed in 1969 for six months to the Technical Analysis and Advisory Group, Deputy Chief of Naval Operations (Research and Development).

During employment with the Army and the Navy, he has served on special committees and joint service groups. Following five years as a research associate professor at the University of Virginia, he joined the Medical College of Virginia in 1956 as associate professor of biophysics. He received the Medical Faculty Award (1958-60).



Dr. L. A. Mounter



# OCRD Announces 5 Officer Assignments

Brig Gen George Sammet Jr. started 1970 by returning for his third tour of duty in the Office of the Chief of Research and Development, HQ DA, this time as head of the Plans and Programs Directorate, following a tour of duty in Korea.

Until Sept. 1, 1967, when he became deputy for Operations, Developments Directorate, HQ U.S. Army Materiel Command, Washington, D.C., he had served for 13 months as OCRD executive. In Korea he was the senior adviser, First Republic of Korea Army.

General Sammet served in OCRD from July 1959 to August 1962, first as a staff officer in the International Division, staff officer in the Programs and Budget Division, field army developments officer, assistant chief, Combat Materiel Division and then deputy director of Developments. He was deputy director, OCRD Missiles and Space Division from September 1964 until he moved up to OCRD executive.

Following graduation from the National War College in 1963, he commanded the 4th U.S. Army Missile Command in Korea. He is also a graduate from the Army Command and General Staff College, and the Armed Forces Staff College, with a BS degree from the University of Illinois and an MA degree from George Washington University.

COL GEORGE A. LUTZ is assigned as OCRD deputy director of Developments after serving as deputy systems manager for the Advanced Aerial Fire Support System (AAFSS). He was a military assistant, Office of the Deputy Director of Research and Engineering in Washington, D.C., 1967-69.

During 1966-67, he was chief of the Aviation Division, Army Concept Team in Vietnam (ACTIV), subsequent to completing the National War



Brig Gen George Sammet Jr.

College at Fort Leslie J. McNair, Washington, D.C. in 1966.

Col Lutz in 1964-65 was a faculty member at the Defense Weapons Systems Management Center, Wright-Patterson Air Force Base, Ohio. That duty followed an assignment with HQ U.S. Army Materiel Command as deputy project manager for CV2 (Caribou) and CV7 (Buffalo) aircraft.

Col Lutz has a BS degree from the University of Maryland (1953) and an MS degree from the University of Tennessee (1954).

After entering military service in 1938, he served at Carlisle Barracks, Pa.; U.S. Military Academy, West Point, N.Y.; in Germany; Washington, D.C.; Fort Ord, Calif.; Fort Eustis, Va.; Korea; and Redstone Arsenal, Ala. His awards include the Legion of Merit (LOM) with Oak Leaf Cluster (OLC), Distinguished Flying Cross (DFC), Air Medal (AM) w/6 OLC, Meritorious Service Medal, Army Commendation Medal w/3 OLC, and the Purple Heart.

LT COL CHARLES F. BLISS completed the C&GSC course and attended the University of Rochester, where he earned a master's degree in business administration, prior to assignment to the Studies and Analyses Division.



Col George A. Lutz

A 1955 graduate of the U.S. Military Academy, he was a tactical officer at the academy (1963-66), then served a year as an adviser with the Vietnamese Airborne Division, RVN.

Two tours of duty were served with the 101st Airborne Division at Fort Campbell, Ky. (1956-58 and 1962-63). He was an adviser with the Military Assistance Advisory Group in Iran (1958-59); and OCS tactical officer, Airborne Department and assistant commandant, U.S. Army Infantry School, Fort Benning, Ga. (1959-62).

His citations and decorations include the Bronze Star Medal (BSM), ARCOM, Vietnam Service Medal w/2 Battle Stars, Combat and Expert Infantryman Badges, Armed Forces Honor Medal and the Master Parachutist Badge.

LT COL WILLIAM F. STECHER JR. is the new chief of the U.S. Army Research Unit, Korea, following more than two years service with the Assistant Chief of Staff, Intelligence, Washington, D.C.

From March 1963 to June 1966, he was assigned to the 5th Battalion, 73d Artillery; the 1st Battalion, 36th Artillery; and with HQ Seventh Army, U.S. Army Europe (USAREUR).

Lt Col Stecher earned a BS degree in bacteriology from Ohio State University in 1952 and completed the associate course at the C&GSC in 1966.

MAJ R. T. DETRIO served a tour of duty in Vietnam and then completed the Adjutant General Officer's Advanced Course at Fort Benjamin Harrison, Ind., prior to assignment as adjutant, Army Research Office.

Commissioned in 1962, after graduating with a BS degree in economics from Spring Hill College, Mobile, Ala., he was assigned to Germany for two years prior to duty as an adviser at HQ III Corps, Tactical Zone, Bien Hoa, Vietnam. He attended the Graduate School of Business, University of Maine, 1964-65, Industrial College of the Armed Forces National Management Seminar (1965) and the Airborne School (1966).

## Col Ray Assigned as CDC Liaison for MASSTER

Col William B. Ray, chief of the Strategic Operations Division, HQ U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., has been assigned as liaison officer for CDC on Project MASSTER at Fort Hood, Tex.

Project MASSTER (Mobile Army Sensor Systems Test, Evaluation and Review) is one of several reorganizations recently approved by the Chief of Staff and the Secretary of the Army to provide a Surveillance, Target Acquisition and Night Observation (STANO) management structure.

Close working relations to achieve objectives of MASSTER involve the Army Materiel Command, CDC, Continental Army Command, and the Army Security Agency.

A sensor expert in CDC doctrine since 1967, Col Ray will help formulate the user-tests on mechanical and electronic sensors as well as radar and other vision and surveillance devices for the Integrated Battlefield Control System.



Col William B. Ray



# MRC Sets Nonlinear Programing Symposium May 4-6

Presentations during a Symposium on Nonlinear Programing, May 4-6, at the Mathematics Research Center, University of Wisconsin, will be made by experts from England, France, West Germany, The Netherlands and the United States.

Progress has been made recently in the development and analysis of computationally efficient methods for solving nonlinear program problems. The symposium speakers, selected as among the most active in this important area, will emphasize this aspect of their work.

Applications of nonlinear programing to statistics and other areas also will be discussed. Informal discussion of papers from the floor will be encouraged, with emphasis on possible applications of new knowledge.

Mathematical programing, or constrained optimization, is concerned with the problem of optimizing (either

## AMC Ties Cost Centers To Materiel Procurement

Substantial Army Materiel Command resources will be committed to development and use of an improved cost analysis and estimating systems.

An AMC announcement in mid-January said in-depth training activities are being increased and that available resources are being reviewed to insure full effectiveness in use. Particular attention is directed to identify the reasons for cost growth and to take corrective action.

Maj Gen Paul A. Feyereisen, AMC deputy CG for Materiel Acquisition and the director of the high-priority Project PROMAP-70 (Program for Refinement of the Materiel Acquisition Process), recently spelled out objectives of the cost-analysis activities.

Cost centers will be established at each commodity command to validate cost estimates from an improved data base, and to develop methods for better cost estimates of the life-cycle of materiel. Since the first announcement of PROMAP-70 was made in December, the number of tasks involved in the total program has been increased from 38 to 47.

Manpower has been increased by 250 spaces for the commands to achieve the desired level of effort in the analysis/cost estimating process, the AMC announced. Representatives from the HQ AMC Cost Analysis Division have visited each subordinate command to advance the program.

In addition, a pilot project by the HQ AMC Cost Analysis Division is constructing a model procedure for cost tracking of weapon systems.

maximizing or minimizing) a numerical function (the objective function) of one or more variables subject to constraints on the variables.

Cost is frequently taken as the objective function to be minimized, but it can be time required for performance, or total manpower required, or one of various other values. When the objective function or any of the constraints are nonlinear, a problem is posed in nonlinear programing.

Various aspects of the over-all problem will be discussed in presentations by Jean M. Abadie, Université de Paris and Électricité de France; Ian Barrodale, University of Victoria, British Columbia, Canada; James W. Daniel, University of Wisconsin; and

R. J. Duffin, Carnegie-Mellon University; Roger Fletcher, Atomic Energy Research Establishment, Harwell, England; Arthur Geoffrion, University of California, Los Angeles; Gene H. Golub, Stanford University; Pierre Huard, Electricité de France; and

Carlton E. Lemke, Rensselaer Polytechnic Institute; Garth P. McCormick, Research Analysis Corp. and the Mathematics Research Center; R. R. Meyer, Shell Development Co.; Lucien W. Neustadt, University of Southern California; M. J. D. Powell, Atomic

Energy Research Establishment, England; and

R. Tyrrell Rockafeller, University of Washington; H. Whitting, Institut für Mathematische Statistik der Universität Münster, West Germany; and Guus Zoutendijk, Centraal Reken-Instituut der Rijksuniversiteit, The Netherlands.

A detailed program of the symposium and information on registration and accommodations will be available about Mar. 1, 1970. Requests for the program and all related inquiries should be directed to: Prof. J. Ben Rosen, Mathematics Research Center, University of Wisconsin, Madison, Wis., 53706.

## 3 'Research Trends' Articles Of Interest to R&D Community

Three articles that merit the interest of readers in the Army research and development community are carried in the Winter 1970 edition of *Research Trends*, quarterly publication of the Cornell Aeronautical Laboratory.

"Jet Upset," by G. Warren Hall, an evaluation pilot and project engineer in CAL's Flight Research Department, reports on findings as they affect design of jet aircraft and pilot operation.

"Spotting the Drunken Driver" describes a new device that measures the unsteadiness of an operator's eyes as a more realistic indication of how seriously his driving is affected than other equipment and tests currently used by police officers. The device was developed by the author, Dr. E. Donald Sussman, who is the principal investigator on a Department of Transportation research project.

"Better System for Warning Pilots of Malfunctions" is a report on Project Merlin as conducted under project engineer Dr. William C. Schultz of the CAL Avionics Department.

## Army Schedules 12 Pershing Firings for 1970

U.S. Army and Federal Republic of Germany (FRG) troops will participate in practice firing of 12 rounds of the Pershing missile, April through July, at Black Mesa, Utah.

The rounds will be programed to impact on White Sands Missile Range (WSMR), N. Mex., 350 miles away.

Units of the FRG Air Force will fire four Annual Service Practice (ASP) rounds, using the older model P-1 ground support equipment on tractor-type tracked vehicles.

Units of the Seventh U.S. Army will fire eight rounds, using the new P-1A ground support equipment mounted on 5-ton, 8-wheeled, rubber-tired vehicles. Six firings will be for Demonstration and Shakedown Operations (DASO).

Simulated tactical conditions will prevail. Exact dates and times for firings may not be announced until the troop units are placed on firing alert status a few hours before launch.

Among the first to arrive at Black Mesa will be troops of the 2d Battalion, 44th Artillery, 9th Field Artillery Group, from Fort Sill, Okla. Most major field elements of WSMR will join with the U.S. Army Field Artillery Missile Systems Evaluation

Group (FAMSEG) of Fort Sill, and officials of the Pershing Project Manager's Office (PPMO), Redstone Arsenal, Ala.

The Utah-to-New Mexico firings, conducted under rigidly controlled conditions for safety, provide training for troops and test evaluation data for the product improvement program. Missiles are not fired for practice or training purposes in Europe.



PERSHING Power Unit, mounted on new 8-wheel, 5-ton cargo truck, consists of the Improved Programmer Test Station and Power Station. Both pairs of front wheels are steerable for substantially increased maneuverability.



# Army Medical Research, Nutrition Lab Yields Benefits Worldwide

Investigation of the soldier's diet, nutrient intake and health related to food requirements in all environments is part of the mission of the U.S. Army Medical Research and Nutrition Laboratory.

Located at Fitzsimons General Hospital (FGH), Denver, Colo., the MRNL observed its 25th anniversary in September 1969. Originally it was established in 1944 as the Medical Nutrition Laboratory (MNL) near the former Quartermaster Food and Container Institute in Chicago, Ill., as successor to a small laboratory set up in 1942 at the Army Medical School, Washington, D.C.

The next phase in MRNL's growth was the establishment of a unit at FGH to study nutritional aspects of pulmonary disease. In 1947 the MNL unit was incorporated into the then newly organized R&D unit at FGH to do research in tuberculosis and surgery of the heart.

Excellent metabolic ward facilities and other attractive support capabilities led to the move of the MNL from Chicago to the FGH in 1953. Five years later the FGH U.S. Army Medical R&D Unit was combined with the MNL to form the MRNL. Research programs of both units have continued without major organizational change.

Other aspects of the MRNL mission include recommendations of nutritional measures in support of optimum performance, and prevention of disease and environmental injury under all conditions.

In addition, the MRNL provides training to civilian groups and to civil and military populations of other countries as appropriate when such action is judged by higher authority



**Col John E. Canham**  
*USAMRNL Commanding Officer*

to be important to U.S. national policy and defense.

Development of standards and programs to insure wholesomeness of military food and research in military food hygiene are MRNL responsibilities. The laboratory also conducts research on medical and surgical problems of special Army interest, including clinical research support.

Particular attention is given to collaborative effort with FGH in pulmonary disease research, study of the physiology of exercise and fatigue in coordination with other Army Medical R&D Command laboratories, and application of computer techniques in medical research and nutrition.

MRNL's eight divisions occupy over 84,000 square feet of space, including a laboratory facility atop Pike's Peak (14,110 feet), staffed by chemists, research veterinarians, physicians, biologists and computer specialists—in short, a cross-section of the scientific professions.

MRNL achievements can best be described under a divisional listing.

**Chemistry Division.** In conjunction with other MRNL divisions, personnel conduct many human vitamin requirement studies, specifically in the requirement and metabolism of vitamins B<sub>1</sub>, B<sub>6</sub>, C and A.

Work performed by this division led the National Academy of Science—National Research Council Food and Nutrition Board to establish a recommended vitamin B<sub>6</sub> intake in the 1968 edition of the *Recommended Dietary Allowances*; a decreased level of the daily intake of vitamin C for adults also was recommended.

Trace mineral metabolism and protein and macromolecular biochemistry are also being investigated. Basic biochemical studies are conducted to support the applied studies.

Under agreement between the U.S. Department of Health, Education and Welfare (HEW) and U.S. Army Medical R&D Command (MRDC), the division also functions as the base laboratory in support of the National Nutrition Surveys.

**Computer Division.** This MRNL element stores and retrieves data relating to projects of other divisions and medical analysis of human populations. The retrieval or searching problem is defined in terms of Boolean algebra, through which any item of information is uniquely defined by the pattern of characteristics that are, and are not, associated with it.

This approach is used to build subfiles of related data. *Smoking habits* and the disease *emphysema* can be used as an example. If a person asking questions of the computer defines these two characteristics, a total of four combinations can be distinguished: (1) he smokes and doesn't have emphysema; (2) he smokes and does have emphysema; (3) he doesn't smoke and doesn't have emphysema; or (4) he doesn't smoke and does have emphysema.

The ability to search and retrieve any logical combinations of data items is being used to aid evaluation of nutritional adequacy.

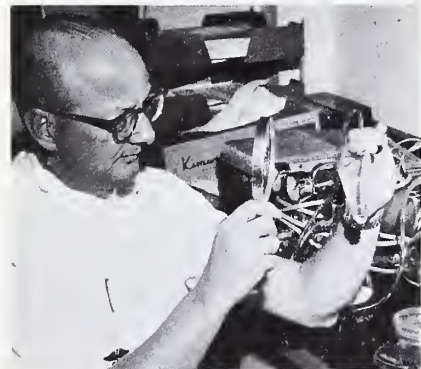
**Joint Studies.** A current study with Fitzsimons General Hospital is directed to long-range effects of oral contraceptives. Another study with Special Forces involves the transmission of medical data over telephone lines. A third provides a data phone linkage to support the Pulmonary Disease Service at Valley Forge General Hospital.

**Bioenergetics Division.** One of the ongoing projects is a study of the effects of various diets upon changes in body composition, metabolism, and energy expenditure induced by rapid ascent to high terrestrial altitude.

Between 6 and 16 men are first studied near sea level (Texas) or at Denver (5,300 feet). Measurements on blood constituents, physical performance and body compositional changes are made before, during and after their residence on Pike's Peak.

During the entire study, everything they eat, drink and excrete is carefully weighed and recorded. Careful analyses are made of the intake and excreta to calculate water balance, minerals, calories and protein.

Results indicate that high-carbohydrate, low-fat diets and keeping physiologically active at high altitude are beneficial in reducing the symptoms of altitude sickness (headaches, nausea,



**QUALITATIVE DEMONSTRATION** of antigen-antibody reactions being studied, using both macro- and micro-gel diffusion methods. Qualitative relationship found between antigens and antibodies may then be studied by quantitative procedures at MRNL.



etc.), maintaining food intake, and reducing losses of body protein and weight. This, in turn, leads to better physical performance.

Dietary surveys are made in Army messes and worldwide in U.S. Army areas of operations. Accomplishments include a better definition of caloric requirements in extremely hot and cold environments, and the demonstration of significant nutrient losses under conditions of profuse sweating.

**Metabolic Division.** Research is conducted in nutrition and metabolism using healthy volunteer test subjects. Selected patients with a variety of endocrine and metabolic disorders also are referred from Fitzsimons General Hospital for specialized study and treatment.

The division's primary responsibility is the operation of the metabolic ward, where volunteer research subjects and patients are housed and fed in such a manner that exact control of all their activities can be maintained. Balance studies in human beings accomplish precise measurements of intake (food, fluids, drugs, etc.) and output (urine, feces, perspiration).

Studies such as these provide information regarding the manner in which the body handles nutritive materials or drugs in health or while under specific stress. Results indicate also the ways that metabolic processes can go awry in various disease states.

Fever mechanisms and body temperature control are other areas of investigation. The fever problem is approached in two ways. In one, fever-producing agents are injected into normal subjects. One agent is piromen, a bacterial cell wall component, and the other is etiocholanolone, a normally occurring male sex-steroid metabolite.

Mechanisms of action and measurably different metabolic responses which result from this study are of

considerable interest. Results may provide the clues for further understanding of the chemical mechanism active in temperature regulation and fever.

In the second type of fever study, patients with a variety of febrile disorders (periodic fever, heatstroke, etc.) have been utilized. Fever has been provoked in various ways in an attempt to recreate in these patients their naturally occurring illness. In addition, a number of chemical agents have been used to control or prevent the fever response.

Findings to date have provided a good deal of interesting information. The hitherto unappreciated role of glucuronic acid and other uronic acids in body temperature regulation has been elucidated.

Much emphasis in the Metabolic Division has been given to studies on the influence of nutrients upon the enzymes of the gastrointestinal mucosa. Results, as reported in a series of publications, have demonstrated that the carbohydrate content of the diet has a significant influence upon the disaccharidase content of intestinal mucosa.

For example, the feeding of diets high in sucrose or fructose to normal humans stimulates the activity of jejunal sucrase and maltase. The rate of stimulation, three to five days, corresponds with the time necessary for the new mucosal cells, which are formed in the crypts, to migrate up and become part of the brush border of the mucosa.

The degree of stimulation is also dose-related. Studies have indicated that the feeding of specific carbohydrates has a definite influence upon the intracellular enzymes of the mucosa. For example, the feeding of galactose stimulates the galactose metabolizing enzymes while the feeding of sucrose, glucose or fructose has definite influence upon the Embden Meyerhof pathway.

A significant observation is that oral folic acid stimulates the glycolytic enzymes of the mucosa and that parenteral folic acid does not. Patients with a malabsorption syndrome are being studied, utilizing the techniques described above.

Other major areas of Metabolic Division interest include muscle metabolism, erythrocyte enzymes, and enzyme kinetics.

**Pathology Division.** Staffed with eight veterinarians and an electron microscopist, the division works primarily in three functional areas: (1) maintaining laboratory animals for all divisions, (2) providing pathology laboratory support to other divisions and (3) performing research. Training in veterinary pathology is given to



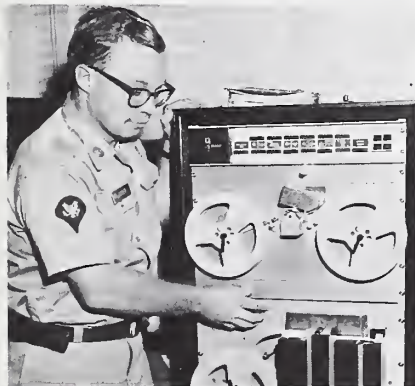
**EQUIPMENT** for monitoring heart and respiration rates during exercise at U.S. Army Medical Research and Nutrition Laboratory, Denver, Colo.

all the officers of the division. Two officers are preceptees in The Surgeon General-sponsored Veterinary Pathology Preceptorship Program.

One of the division's major research efforts is concerned with high-terrestrial altitude effects, studied at the Pike's Peak laboratory (14,110 feet), the main laboratory at Denver (5,300 feet), and various sea level sites. Data are gathered on dogs, cats, rats, monkeys, etc., in an attempt to elucidate the changes seen in short- and long-term exposure to high altitude.

One of the major current research efforts is the nutrition of scout and sentry dogs, as related to problems in using military dogs in Southeast Asia. Results to date point to possible use of a dog food of greater caloric density.

**Microbiology Division.** Operating in close coordination with the Pulmonary Disease Service of Fitzsimons General Hospital for clinical research on tuberculosis, researchers examine metabolic rates of inactivation of biologically active antimycobacterial agents  
(Continued on page 22)



**USAMRNL Computer Division** stores and retrieves data relating to medical test and analysis of human populations.



**VITAMIN METABOLISM** studies are performed with both germ-free and conventional rats at the USAMRNL.



# MRNL Program Yields Benefits Worldwide

(Continued from page 21)

in body fluids. *In vitro* investigative studies are trying to gauge the precise susceptibility or resistance of mycobacteria to drugs. Special reference is made to body fluid concentrations of the drugs required to influence favorably the course of infection.

Selected strains of drug-resistant and drug-susceptible mycobacteria are studied to distinguish metabolic differences associated with the emergence of resistance. Experimental approaches include the mass cultivation of strains, the extraction and assay of enzymes, and the use of radioactive compounds to elucidate intermediary metabolism. Serum from tuberculosis patients is being used to isolate and identify the antigen and/or antibody related to active disease and immunity.

Investigations currently are delving into the possible role of bacterial L-forms in disease of unknown etiology, such as collagen vascular disease, lymphomas, idiopathic pleural effusions, sarcoidosis and others.

Viruses also fall into the realm of the Microbiology Division. Myxoviruses affecting the respiratory system are the subjects. A surveillance for viral infections of the lower respiratory tract is maintained in conjunction with Fitzsimons General Hospital. The antigenicity and the efficacy of myxovirus vaccines, and the mechanisms whereby vaccines afford protection, are investigated.

**Physiology Division.** Study of nutritional and environmental factors influencing normal physiology is combined with a search for the ultimate effects upon behavior and performance. Three joint experiments recently completed at the new Pike's Peak facility exemplify the fundamental research currently in progress to assess effects of rapid, prolonged exposure to high terrestrial altitude upon animal physiology and behavior.

Specifically, the experiments attempted to determine whether gains in body weight and fat deposition result from altitude-induced anorexia or from altitude-induced alterations in nutrient metabolism.

Experiment A was an attempt to ascertain effects of hypoxia and concomitant anorexia upon body weight change; body composition including total water, fat, protein and mineral; nitrogen digestibility, balance and retention; and efficiency of food utilization.

Experiment B explored the cellular mechanisms for decreased fat deposition provoked by exposure to altitude.

To establish the actual changes in rate of fat synthesis, the relative amount of radioactive glucose converted into fat within a specified time period was used as an index of fat deposition. Enzymes responsible for the regulation of the biochemical pathways leading to fat were determined by the concentrations of reactants.

Experiment C measured daily spontaneous activity for the duration of the experiment. Activity was measured using a 40,000-cps ultrasonic sound detection system. Animal movements detected were recorded on tape.

Inferences regarding interactions between physiological and behavioral variables will be possible because the experiments were planned to run concurrently, employ the same population albino rats, and to control similarly the diet, feeding schedule, transportation stress, and handling variables.

In summary, the U.S. Army Medi-

cal Research and Nutrition Laboratory performs research in a variety of medical areas, including nutrition, immunology, metabolically altered states of health, and environmental adaptation, with results benefiting military and civilian populations throughout the world.

## HumRRO VP Is President-Elect Of Psychological Association

Dr. William A. McClelland, executive vice president and secretary of the Human Resources Research Organization (HumRRO), is the president-elect of the District of Columbia Psychological Association.

Scheduled to take over his new responsibilities in 1971, Dr. McClelland served as president of the Division of Military Psychology of the American Psychological Association in 1967-68.

His presidential address to the DMP, titled "The Process of Effecting Change," occasioned wide and favorable response when published in the April 1969 edition of the *Army R&D Newsmagazine*.

## Gast Heads New STRATCOM TAA Agency



John D. Gast

Management responsibility for all telecommunications automation activities of the U.S. Army Strategic Communications Command (STRATCOM) is assigned to John D. Gast as director of the newly established Telecommunications Automation Agency.

Functions related to telecommunications automation are being transferred to the agency at Fort Huachuca, Ariz. on a phased basis as agency capabilities and resources are expanded. Initial planning visualizes a build-up of about 100 professional and administrative personnel early this year, with an ultimate build-up of 250 to 300 personnel.

Gast joined STRATCOM last August as deputy chief, Management Information Systems Office. Until then he was chief, Informa-

tion Sciences Group, Management Information Systems Directorate, Office of the Assistant Vice Chief of Staff, HQ DA.

Gast served as chairman of the Study of Management Information Systems Support (SOMISS), which provided the basis for reorganization and reorientation of Army automated data systems development efforts worldwide.

Prior to entering civil service with the Army in 1967, he worked for nine years in varied management, consulting and technical design positions with Ford's Aeroneutronics Division, Sutherland Co., and URS Corp.

His data systems experience includes logistics, personnel, command control and production control. He has participated in systems development of executive and generalized process software packages.

Among Army projects for which he has had major responsibilities are the Combat Service Support System and the Tactical Operations Center, an early effort to provide automated displays containing tactical information. He was a key staff member on the Tactical Operations System team, responsible for developing an automated storage and retrieval system to support command center operations at HQ Seventh U.S. Army in Europe.

From 1951 to 1959, he was employed by the U.S. Air Force in planning, analysis and design of computer-based information systems, including the automated system for logistics support of the ballistic missile program.

Gast has an AB degree in political science from the Wittenberg University in Springfield, Ohio, and has done graduate work at the University of Michigan and Ohio State University.



# WES Test-Load Cart Simulates Superjet Traffic on Airfields

Can existing airfield pavements, designed to withstand weights of 200,000 pounds, hold up under 750,000-pound loads imposed by military and commercial superjets such as the C5A and the Boeing 747?

Will established criteria provide valid designs to meet future airfield pavement specifications?

These are but two of the questions that the Army, Air Force and Federal Aviation Administration are seeking to answer in a joint effort to provide certain criteria for the future design, construction, use and maintenance of airfield pavements.

In tests at the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, Miss., engineers are using a test-load cart to simulate traffic of a plane on airfield pavements.

Built to WES specifications, the 60-foot-long, 100,000-pound cart has four drive wheels with electric motors built into each wheel. The motors are powered by a 475-hp diesel engine driving a central generator.

Each of the tires is 8 feet 2 inches in diameter and 3 feet 6 inches wide. Two load carts with six wheels each are assembled inside the big frame, simulating the undercarriage of the C5A military sky giant.

Test traffic is being applied under the full prototype loading of one 12-wheel main landing gear on sections of both flexible and rigid pavement. Each section incorporates items of different thicknesses planned to fail at various load repetition levels. Both test sections are instrumented with stress, strain and deflection measuring devices at various depths.

Research results are shattering some false concepts about the strength requirements for airfield pavements, demonstrating that the strength of a pavement need not be increased proportionately with the weight of the aircraft.

Ground flotation studies conducted at WES for the Air Force, for example, have resulted in improved methods for design of a landing gear configuration. Changes could enable planes as long as a football field to land on existing airfield pavements or on virtually any soil over which a car can be driven.

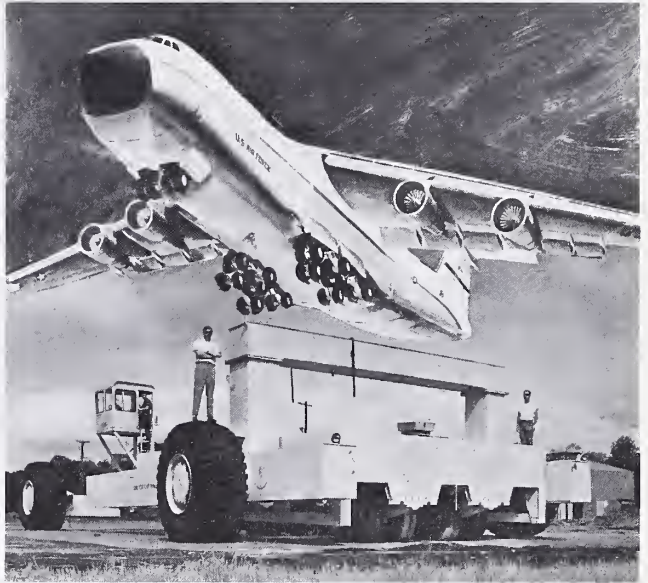
One of the key factors is the number and spacing of the plane's wheels. If the wheels are spaced correctly, the landing strip reacts to the load of each wheel in the assembly as it would to a single wheel.

Another major factor is "drag" or the ability of a soft surface to slow

the plane as the landing gear moves over it. To check drag effects, WES engineers used a model wheel much smaller than the one on a real plane and ran it over soft soil in carts at 20 mph, rather than the actual 200-mph speed of the plane.

WES personnel have been designing flexible pavements and the Ohio River Division of the Army Corps of En-

gineers has been responsible for rigid pavement design since World War II. Responsibility for rigid pavement design recently was transferred to the Construction Engineering Research Laboratory (CERL) at the University of Illinois. (See August-September 1969 issue of the *Army R&D Newsmagazine*, p. 1, for Corps of Engineers dedication of CERL.)



TEST LOAD CART is used at Waterways Experiment Station to obtain data for designing efficient landing gear. Two load carts, each mounted on six wheels, are designed to simulate undercarriage of C5A aircraft shown above.

## ECOM Research Board Elects Chairman, Fills Vacancies

The U.S. Army Electronics Command (ECOM) 9-member Research Board recently elected a new chairman and filled two vacancies.

Dr. Edward H. Poindexter, a senior research scientist in ECOM's Institute for Exploratory Research, succeeds Dr. Herbert F. Hunger, the board's first chairman, who served 2 years.

Maj Gen Walter E. Lotz Jr., CG of ECOM and Fort Monmouth, N.J., appointed as new members Dr. Larry U. Dworkin, an electrical engineer in the Communications and Automatic Data Processing Laboratory, and Dr. Edward J. Sharp, a physicist in the command's Night Vision Laboratory at Fort Belvoir, Va.

They succeed David Dence, studying for his doctorate at the University of Rhode Island, and Dr. Leon Esterowitz, who has accepted a position with industry. Prior to their departure, they received Certificates of Appreciation for their work with the board.

Dr. Hunger was awarded a \$200 honorarium and a Special Act Award

for outstanding service as chairman. A senior research scientist in the Electronic Components Laboratory, detailed to the Institute for Exploratory Research, he remains a member.

Other members are Ronald C. Hallendorf, Combat Surveillance, Target Acquisition and Systems Integration Laboratory; David C. Kandra, Product Assurance Directorate; Richard G. Murray, Electronic Warfare Laboratory's activity at White Sands Missile Range, N. Mex.; Joseph T. Saganowich, Avionics Laboratory; and Joseph H. Shinn, Atmospheric Sciences Laboratory's activity at Fort Huachuca, Ariz.

Board members help ECOM to obtain the maximum return from its research resources by participating directly in specific projects rather than serving only as supervisors or administrators. They review research proposals and changes in goals or resource requirements, and also recommend approval, modification or special coordination.

## Scientific Calendar

Launch Operations Conference, sponsored by AIAA, Cocoa Beach, Fla., Feb. 2-4.

1970 Annual Symposium on Reliability, sponsored by IEEE, Los Angeles, Calif. Feb. 3-5.

SPI Reinforced Plastics/Composites Division Conference, Washington, D.C., Feb. 3-6.

Advanced Space Transportation Meeting, sponsored by AIAA, Cocoa Beach, Fla., Feb. 4-6.

Aerospace and Electronic Systems Winter Convention, sponsored by IEEE, Los Angeles, Calif., Feb. 10-12.

International Solid-State Circuits Conference, sponsored by IEEE, Philadelphia, Pa., Feb. 18-20.

International Symposium on Nondestructive Testing of Nuclear Reactor Components, Rotterdam, Netherlands, Feb. 26-27.

5th Session of the World Meteorological Organizations, sponsored by Commission for Synoptic Meteorology, New Delhi, India, Feb. (date undetermined).



# Major Army RDT&E, Procurement Contracts Exceed \$944 Million

Contract modifications issued to Western Electric Co., aggregating \$351,102,170 for antiballistic missile, radar components and radar site work, are included in Army RDT&E and procurement contracts totaling \$944,200,433 from Nov. 10, 1969 to Jan. 1, 1970. Only contracts exceeding \$1 million are listed.

Hughes Aircraft Co. received three contracts totaling \$73,476,900 for TOW missiles, ground support equipment, and long-range night-observation devices. Remington Arms Co., Inc., was issued a \$52,812,305 order for loading, assembling and packing small arms ammunition.

Two modifications totaling \$36,486,751 went to Olin Mathieson Chemical Corp. for propellants, ammunition components, and maintenance activities at two ammunition plants.

Hercules, Inc., is receiving \$33,010,173 (four contracts) for propellants and explosives, plant maintenance and nonproduction facilities. Mason & Hanger, Silas Mason, Inc., received two contracts totaling \$27,223,663 for loading, assembling and packing ammunition.

Three contracts totaling \$26,705,331 with Chamberlain Manufacturing Corp. call for metal parts for 105-mm, 175mm and 2.75-inch projectiles. Uniroyal, Inc., received \$20,528,768 for production, loading, assembling and packing ammunition.

*Contracts under \$20 million.* Philco Ford Corp., \$18,761,787 (two contracts) for engineering services and ground support equipment; General Motors Corp., \$14,461,791 (five contracts) for storage batteries, work on the M551 Sheridan vehicle, and for engineering services and procurement of hardware for the XM70 Main Battle Tank; and

Eastman Kodak Co., \$12,436,414 for explosives; Norris Industries, Inc., \$10,783,385 (four contracts) for 105mm cartridge cases, motor tubes for 2.75-inch rocket motors, 81mm projectiles, production support and maintenance at the ammunition plant; and

Mine Safety Appliance Co., \$10,361,655 for protective field masks; AVCO Corp., \$10,138,099 (four contracts) for turbine engines and modification kits for turbine engines.

*Contracts under \$10 million.* ITT Corp., \$9,257,600 for AN/GRC-143 radio sets; Control Data Corp., \$7,500,000 for electronic equipment; Research Analysis Corp., \$7,122,130 for research and studies on Army tactical operations and forecasting R&D material requirements; and

Atlas Chemical Industries, Inc., \$6,952,576 (two contracts) for production of TNT, plant maintenance, and nonproduction activities; General Time Corp., \$6,590,282 for fuzes; Rulon Co., \$6,547,800 and Keystone Manufacturing Corp., \$6,379,380 for

fuzes parts; and

Chrysler Corp., \$6,321,440 (two contracts) for rangefinders and system engineering management for M60A1 tanks; Day and Zimmerman, Inc., \$6,000,000 for loading, assembling and packing projectiles and ammunition components; and

Consolidated Box Co., Inc., \$5,600,300 for fiber containers; Aluminum Co. of America, \$5,590,250 for tubes for 2.75-inch rocket motors; FMC Corp., \$5,452,176 (two contracts) for M113A1 Armored Personnel Carrier vehicles and carriers for Chaparral guided missiles.

*Contracts under \$5 million.* Stevens Manufacturing Co., \$4,983,981 for semitrailers; Bell Helicopter Co. and Aerospace Corp., \$4,886,520 (three contracts) for UH-1H helicopters, transmission assemblies for OH-58A helicopters, and for a naval air maintenance trainer for AH-1J helicopters; and

Walter Kidde & Co., Inc. \$4,819,500 for fuze parts; General Electric Co., \$4,781,814 (two contracts) for armament subsystem pintle mounts for 7.62mm machineguns and parts for the XM35 armament subsystem for the Huey helicopter; and

Etowah Manufacturing Co., Inc., \$4,662,400 for parts for M125A1 boosters; Thiokol Chemical Corp., \$4,617,831 (two contracts) for loading, assembling and packing ammunition and for CS2 riot control agent; Ravenna Arsenal, Inc., \$4,602,735 for loading, assembling and packing ammunition; and

DVA Corp., Mt. Laurel, N.J., \$4,592,000 for parts for M125A1 boosters; Texas Instruments, Inc., \$4,500,000 for electronic equipment; Goodyear Tire and Rubber Co., \$4,363,749 for track shoe assemblies for combat tanks; and

Hercules Engines, Inc., \$4,356,815 (two contracts) for engines; United Ammunition Container Corp., \$4,277,100 for fiber containers; Standard Container Co., \$3,686,500 for ammunition containers; McGraw Edison Corp., \$3,543,284 for artillery and mortar fuzes; and

I.D. Precision Components, \$3,504,000 for parts for boosters; Northrop Carolina, Inc., \$3,459,264 for CS2 riot control agent; Hamilton Watch Co., \$3,365,752 for ammunition fuzes; Levinson Steel Co., \$3,197,568 for 105mm projectiles; and

Wells Marine, Inc., \$3,149,138 (two contracts) for 20mm projectiles and cartridge belts; Continental Motors Corp., \$2,958,650 for engine assemblies for 5-ton trucks; Whittaker

## WES Tests Amphibian Utility Craft for Navy

Rotary screwing its way through the swamps of southern Louisiana these days is a strange-looking craft being tested for the U.S. Navy by the Army Engineers Waterways Experiment Station (WES) at Vicksburg, Miss.

The amphibian Riverine Utility Craft (RUC) is an offspring of the experimental Marsh Screw Amphibian that Chrysler Corp. developed for ARPA and the Navy Bureau of Yards and Docks, redesignated the Naval Facilities Engineering Command.

WES personnel also tested the Marsh Screw in the Mississippi mud areas and on sand bars near Vicksburg. The southern Louisiana site was selected for the RUC tests because of 28 variations in terrain, many similar to those in the Mekong Delta of South Vietnam.

Powered by twin marine 440-cubic-inch V-8 engines, the 7½-ton RUC is 20 feet long, and is capable of moving with equal ease from bayous to tidal flats to marshes.

Cruising speed in mud is 17.5 knots, but when the RUC hits hard ground or a surface into which the screws cannot dig, and the vehicle rolls sideways with both pontoons moving in the same direction, slowing it to 3 knots. It is capable of climbing 3-foot-high earth walls.



Riverine Utility Craft



Corp., \$2,924,625 for igniters for 2.75-inch rocket motors; and,

Vibrations Labs., Inc., Bloomingdale, N.J., \$2,876,400 for electric blasting caps; Bulova Watch Co., \$2,831,746 (two contracts) for head assemblies for fuzes and for XM577 time fuzes; and

Hughes Tool Co., \$2,760,000 to tear down and repair crash-damaged OH-6A aircraft; National Presto, Inc., \$2,699,235 for high-explosive projectiles; Kollsman Instrument Corp., \$2,549,055 (two contracts) for M18A1 mine metal parts and M57 firing devices; and

Brads Machine Products, Inc., Gadsden, Ala., \$2,432,000 for parts for M125A1 boosters; American Optical Co., \$2,388,206 for target detecting devices for Chaparral missiles; Bell & Howell Co., \$2,300,042 (two contracts) for grenade fuzes and parts for M84A1 time fuzes; and

Emerson Electric Co., \$2,198,000 for helicopter armament subsystem repair parts; Booz Allen Applied Research, \$2,150,000 for engineering support for Project Mallard; Kaiser Steel Corp., \$2,127,975 for M2A1 ammunition boxes.

*Contracts under \$2 million.* Ammann & Whitney, \$1,978,874 for architectural and engineering services in development of design criteria for tactical structures and for weapon system contractor support for Perimeter Acquisition Radar sites in the Safeguard antiballistic missile system; and

Federal Container Corp., \$1,943,100 for fiber containers; Gulf & Western Industries, Inc., \$1,887,300 for 20mm cartridge belts; Fruehauf Corp., \$1,875,020 for M674 semitrailers and components; Whittaker Corp., \$1,812,000 for assembling, loading and packing fuzes; and

Global Associates, \$1,776,762 for support at Kwajalein Missile Range; Paper Tubes, Inc., \$1,723,110 for containers; Baldwin Electronics, Inc., \$1,707,075 for loading, assembling and packing 2.75-inch rocket motors; and Rohm & Haas Co., \$1,700,000 for solid-propulsion technology; Miller Trailers, Inc., \$1,674,456 for electronic van semitrailers; Rayethon Co., \$1,666,535 for transistorized tactical field unit components; and

ITT Gilfillan Inc., \$1,641,000 for AN/TPN-18 radars and ancillary items; Uniroyal, Inc., \$1,618,872 for TNT and loading, assembling and packing ammunition; Adventure Line Manufacturing Co., \$1,582,624 for 20-round magazine assemblies for M16 weapons; and

KDI Precisions Products, Inc., \$1,536,104 for 2.75-inch rocket fuze parts; United States Steel Corp., \$1,525,320 for high-explosive projec-

tiles; Maremont Corp., \$1,487,130 for 7.62mm machineguns; Bauer Ordnance Co., \$1,463,000 for modification of weaponry systems of M-114A1 command and reconnaissance vehicles; and

Teledyne Mid-America Corp., \$1,456,575 for mounted mine-clearing rollers; Acton Laboratories, Inc., \$1,415,520 for telephone signal converters; Vitro Corp. of America, \$1,400,000 for engineering services for program support of Project Mallard; and

Thiokol Chemical Corp., \$1,391,432 for surface flares; Sun Battery Co., Inc., \$1,351,840 for dry-charge batteries; Aluminum Specialty Co., Manitowoc, Wis., \$1,347,445 for 20mm cartridge belts; M. C. Ricciardi Co., \$1,332,818 for containers; and

Barry L. Miller Engineering, Inc., Hawthorne, Calif., \$1,321,181 for

20mm cartridge belts; R. L. Pohlman Armament Co., \$1,257,051 for M505A3 fuzes; Galion Amco, Inc., \$1,257,051 for M505A3 fuzes; Pace Corp., \$1,246,390 for surface flares; and

Colt's, Inc., \$1,234,901 for M16A1 and M16 rifles; Airport Machining Corp., \$1,100,000 for 2.75-inch rocket parts; Consolidated Molded Products, \$1,086,720 for M18A1 mine parts; Atwood Vacuum Machine Co., \$1,078,056 for 20mm cartridge belts; and

AMETEK Corp., \$1,056,610 for stabilizer rods for 2.75-inch rocket motors; Zenith Radio Corp., \$1,053,000 for 2.75-inch rocket fuzes; Massachusetts Institute of Technology, \$1,035,550 to establish and operate a program in computer analyses and modeling in the behavioral sciences; Stanley Consultants, Inc., \$1,031,000 for engineering services on the Missile Site Radar complex.

## NRC Publishes Toxicology Services Directory

Information capabilities in fields related to toxicology provided by more than 750 organizations are described in a new directory published by the Library of Congress National Referral Center for Science and Technology, Washington, D.C.

Acknowledgment is made for support from the Toxicology Information Program, National Library of Medicine, in compiling the comprehensive document, including an appendix listing of poison control centers.

The directory includes federal, state and local government activities, academic and industrial research groups, professional societies, national associations, laboratories, libraries, herbariums, museums and other organizations. Holdings, publications and services are detailed.

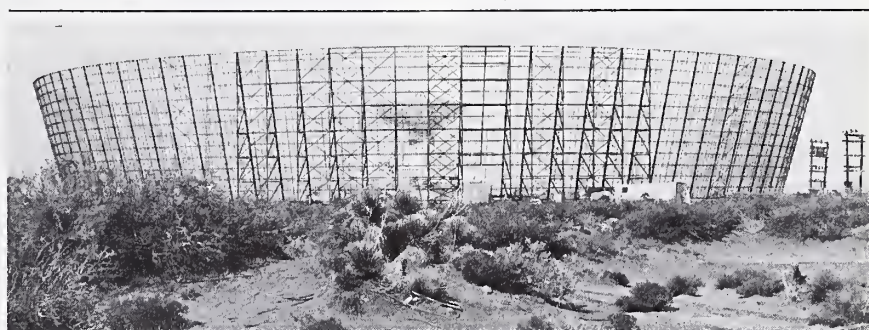
Material for the directory came from the National Referral Center's central register of information re-

sources, built up since the center was established in 1962 with the support of the National Science Foundation.

Earlier directories compiled by the center have listed information resources in the Physical Sciences, Biological Sciences and Engineering (1965); Social Sciences (1965); Water (1966); and the Federal Government (1967).

The center has a free referral service to direct those who need information to those who can provide it. In response to telephone or mail requests for assistance, the center provides names, addresses, telephone numbers, and brief descriptions of appropriate information resources.

Details about NRC activities can be obtained by telephoning 202-967-8242 or by writing to the National Referral Center for Science and Technology, Library of Congress, 10 First Street, S.E., Washington, D.C. 20540.



**SOUTHWEST'S TALLEST FENCE**, 105 feet high and 2,200 feet in circumference, is shown shortly after construction work was completed in December. The huge clutter fence, or electromagnetic shield, surrounds the U.S. Air Force's RAM radar facility at White Sands Missile Range (WSMR), N. Mex. For size comparison, a 30-foot-long trailer is parked at the lower right portion of the fence, erected at a cost of \$850,000 to afford WSMR scientists another 10 seconds of clutter-free tracking time during critical reentry phase of test-fired missiles.



## NAS Appoints MERDC Engineer to Technical Committee

Appointment of Thomas G. Timberlake of the U.S. Army Mobility Equipment Research and Development Center (MERDC), Fort Belvoir, Va., to a technical committee of the National Academy of Sciences was announced Jan. 21.

Timberlake's 3-year appointment is on the NAS Highway Equipment Committee, Highway Research Board. The committee includes a representative from the U.S. Department of Transportation; the chief engineers of Euclid Inc., Iowa Manufacturing Co., Bucyrus-Erie Co., and Rex Chainbelt Inc.; and the deputy chief engineer of the Department of Highways in Colorado and Texas.

The committee is concerned with encouraging and participating in research in the utilization, application, performance and development of equipment for highway construction and maintenance work.

Presently chief of the MERDC Engineering Laboratory, Timberlake came to the center in 1956 from the Army Engineer Maintenance Center, Columbus, Ohio, where he had served

as chief, Maintenance Engineer Division. He was chief, Mechanical Technology Laboratory at the R&D Center until the Engineering Laboratory was established in 1961.

A 1941 graduate of the University of Maryland with a BS degree in mechanical engineering, Timberlake is a registered professional engineer, and a member of the Society of American Military Engineers and the Society of Automotive Engineers. He has served on various committees of the latter and has authored a number of technical papers for presentation and publication, dealing primarily with earth-moving and construction equipment.



Thomas G. Timberlake

## Harris Commands CDC Field Artillery Agency

Col Walter R. Harris was assigned recently as CO of the U.S. Army Combat Developments Command Field Artillery Agency, Fort Sill, Okla.

Until he returned to the U.S., he was deputy senior adviser to the Vietnamese, Capitol Military District, Vietnam. In 1966 he was chief, Pershing Operational Test Unit, Office of the Deputy Chief of Staff for Operations, U.S. Army Europe, following duty as deputy commander, Seventh Army Artillery in 1965.

Col Harris has served as CO of the 1st Battalion, 81st Artillery, Fort Sill; in the Office of Deputy Chief of Staff, CDC, Fort Monroe, Va.; and with Field Artillery units in Korea.

After completing the Officer's Advanced Course at Fort Sill in 1953, he was assigned to the Combat Developments Department, Antiaircraft and Guided Missile Branch, Artillery School, Fort Bliss, Tex.

Graduated from the U.S. Military Academy in 1944, he attended the Officer's Basic Course at Fort Sill prior to assignment to the Infantry Division's 607th Field Artillery at Fort Benning, Ga. He accompanied that unit to Europe and participated in campaigns in France, Germany and Austria.

Awarded an MS degree in mechanical engineering from Johns Hopkins University in 1950, he completed the Command and General Staff College in 1957 and the Army War College in 1962. His decorations include the Legion of Merit with Oak Leaf Cluster (OLC), Bronze Star, Air Medal, Army Commendation Medal with OLC, the Vietnamese Distinguished Service Order Second Class, Vietnamese Ranger Patch, and campaign ribbons for Europe and Vietnam.



Col Walter R. Harris

## MICOM Picks Hatchett to Head Chaparral Office

Appointment as chief of the Chaparral Management Office recently became Lt Col Monte J. Hatchett's third progressive assignment since 1967 at HQ U.S. Army Missile Command (MICOM), Redstone Arsenal, Ala.

Col Hatchett directs the development, production and field support of the Chaparral, one of two weapon systems selected by the Army to provide field commanders with low-altitude air defense. The other system is the Vulcan 20mm automatic gun.

He had served since March as chief, System Support Division, Pershing Project Manager Office. Earlier he was at the Army Missile and Munitions Center and School as chief, Planning and Operations Division, Office of Operations. During 1966-67, he was in Vietnam with the 2d Maintenance Battalion.



Lt Col Monte J. Hatchett

## TECOM Organization Changes Include Establishment of TSAD

Organizational realignments with HQ U.S. Army Test and Evaluation Command at Aberdeen (Md.) Proving Ground, including establishment of a Test Systems Analysis Directorate (TSAD), became effective Jan. 1.

TECOM CG Maj Gen Frank M. Izenour said changes are part of a continuing effort to strengthen operational capabilities and improve management of the U.S. Army principal materiel testing organization.

TSAD is comprised of three major subdivisions concerned with methodology, instrumentation, and operations research. Col Vitaly Kovalevsky, since last October the director of Infantry Materiel, heads the directorate.

Col Cornelius J. Molloy Jr., who headed the Plans and Operations Directorate, remains as director under its redesignation as the Test Operations Directorate (TOD). Without the Methodology and Instrumentation Divisions, now part of TSAD, the TOD will concentrate attention on planning and control activities.

Another change gives Brig Gen Michael Paulick responsibilities as chief of staff in addition to primary assignment as deputy CG. Former Chief of Staff Col Warren D. Hodges is now deputy chief of staff (DCS) for Support and former DCS Col William H. Hubbard is now DCS for Test and Evaluation.



## Col Gelini Succeeds Lamp as MERDC Commander

Change of command ceremonies at the U.S. Army Mobility Equipment Research and Development Center, Fort Belvoir, Va., late in January made Col Walter C. Gelini the successor to Col Russell J. Lamp, CO since June 10, 1969.

Col Lamp was selected for the high-priority Project MASSTER (Mobile Army Senior Systems Test, Evaluation and Review) organization

at Fort Hood, Tex., where he will work with the staff of Maj Gen John Norton.

For the past two years Col Gelini has been Corps of Engineers district engineer at Rock Island, Ill., an assignment that followed a tour of duty in Vietnam as commander of the 79th Engineer Group.

Col Gelini is 45, a native of Collier, W. Va., and was graduated from the

United States Military Academy in 1945. He has master's degrees in civil engineering from Harvard University and in international affairs from George Washington University.

Registered as a professional engineer in the State of Iowa, he is a graduate of the Command and General Staff College and the Army War College. His awards include the Silver Star, Legion of Merit, Air Medal, Meritorious Service Medal and two Army Commendation Medals.

## CDC Designates Col Riffe Director of Organization

Col James L. Riffe became the new director of Organization, U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va., after serving as chief of the Organization and Equipment Division.

Prior to assignment to CDC, he was chief of staff, 82d Airborne Division. He has served as CO, Support Command, 82d Airborne Division, and as a member of the U.S. Delegation to the North Atlantic Treaty Organization Military Committee.

Entering the Army as an enlisted man in 1942, he was graduated from the Infantry Officer's Candidate School, Fort Benning, Ga., and then served with the 27th Infantry Division in the Pacific Theater of Operations.

After World War II, he served with U.S. Army occupation troops in Japan and Australia. In the mid-50s he was one of the initial advisers to the Vietnamese Army and then was assigned as executive officer and deputy commander, 82d Airborne Division. During the Berlin crisis (1961-63), he was assistant chief of staff, G-3, Berlin Command.

In 1964, Col Riffe was assigned as executive officer and subsequently as chief, Organization and Equipment Division, Office of the Deputy Chief of Staff for Personnel, HQ DA.

Col Riffe has been awarded the Legion of Merit with two Oak Leaf Clusters, Bronze Star Medal with OLC, Purple Heart, Army Commendation Medal, Combat Infantryman's Badge and Master Parachutist Badge.



Col James L. Riffe

## Col Rippey Assigned as CE Director at Fort Huachuca

Director of the Communications Engineering Directorate, HQ U.S. Army Strategic Communications Command, Fort Huachuca, Ariz., is the new assignment of Col George E. Rippey, since 1967 the commander of the Army Satellite Communications Agency, Fort Monmouth, N.J.

In his previous assignment he served concurrently as Army project manager for satellite communications under the Army Materiel Command.

Graduated from the University of Kansas with a BE degree in electrical engineering, he has 9 years of Army service and is listed in *Who's Who in Engineering* as a leader and teacher in communications technology. He has been honored for outstanding contributions to research and development.

In World War II he served as signal officer in the Mediterranean and European Theaters. Assignments since 1950 have included plans officer, Office of the Army Chief Signal Officer, and chief, Systems Engineering Division, Defense Communications Agency, both in Washington, D.C.; signal officer, 25th Infantry Division and (later) CO of the 125th Signal Battalion in Hawaii, and signal officer, I Corps Group, Eighth U.S. Army, Korea.

Col Rippey has graduated from the Coast Artillery School, Command and General Staff College, Signal School Advanced Officers Course, and the Defense Weapons Systems Management Course.



Col George E. Rippey



Col Walter C. Gelini

## AVLABS Name Berrisford Structures Division Chief

Appointment of Robert S. Berrisford as the new chief of the Structures Division (formerly Physical Sciences Division), U.S. Army Aviation Materiel Laboratories, Fort Eustis, Va., was announced Jan. 22 by Col John R. Adie, AVLABS CO.

Promoted to the grade of GS-15, Berrisford is responsible for aeronautical structures research and the advanced development program for rotary-wing, vertical, and short-take-off and landing (V/STOL) aircraft.

His primary job is to provide advanced structures technology leading to increased aircraft structural efficiency, simpler construction, reduced maintenance and logistics, and lower life cycle system costs.

Berrisford was an aerospace engineer in the Applied Aeronautics Division at AVLABS, where he has been employed since 1963. He was project engineer for the Utility Tactical Transport Aircraft System (UTTAS) and the Composite Aircraft Program (CAP).

Before joining AVLABS, he was a senior structural design engineer for seven years with the Columbus Division of North American Aviation, responsible for design and analysis of major structural components.

In 1957 he received a BS degree in aeronautical engineering from Ohio State University and he is a member of the American Helicopter Society.



## Oliver Army Clinic Features Innovative Equipment

Push-button-controlled chairs that float on an air pod to enable either a left- or right-handed dentist to perform conveniently in the manner to which he is accustomed are an innovation at a new U.S. Army clinic.

Some of the finest, most up-to-date equipment obtainable is featured in the Oliver Army Dental Clinic at Fort Jackson, S.C., built at a cost of nearly \$500,000. Mobility is a key word in Army combat operations, and it is equally applicable to equipment installed in the clinic.

Army and civilian dentists may use the same equipment to treat patients but they have at least one separative problem. Civilian dentists usually are private practitioners, that is, they set equipment in their offices to individual requirements, expecting to use it many years.

Army dentists, however, like other Army personnel, are here today and gone tomorrow, according to the demands of assignments. Equipment positioned for a right-handed operator necessarily may be used the following day by a dentist who steers tools from the port side.

Oliver Army Dental Clinic has solved that "fixation problem" by eliminating the "anchoring" of dental equipment. Mobility is the answer. Similar model dental clinics are being built at Fort Leonard Wood, Mo.; Fort Sill, Okla.; Fort Bragg, N.C.; and Fort Belvoir, Va.

In the new concept, the dental unit is on casters to permit simple posi-

tioning on either side of the push-button-controlled chairs floating on an air pod. The power umbilical cord allows the unit to be placed anywhere in the operatory area. The ceiling light is hung on a track, permitting it to be rolled to a desired position. Mobile cabinetry completes the equipment.

Important as a "spin-off benefit," in view of a current short supply of dental assistants, Oliver Clinic reports, is that ready accessibility of equipment enables a dentist to operate efficiently without help.

## DoD Eases Service Obligations for Medical Training

Obligated service required of medical officers who receive residency specialty training during active duty in the Armed Forces will be substantially reduced effective July 1.

Generally, the Department of Defense has announced, medical officers (including physicians undergoing long-term formal training) will be required to commit themselves to only two years of active duty in the Army, Navy or Air Force following completion of residency training.

Prior policy required resident physicians in a military medical facility to serve a year of active duty for each year of specialty training. Those re-

ceiving such training in civilian hospitals were required to pay back, or serve on active duty, one year for each year of training plus one additional year. The maximum for those in the latter category will be three years under the change in policy.

Another provision is that medical officers paying back time based on previous requirements generally will have their remaining obligated service reduced by half when the new policy takes effect July 1.

In some cases, however, the reduction could be less than half because no one in the civilian hospital training group will receive a reduction of time which would cause his release prior to June 30, 1971.

The new policy also authorizes pay-back service of only one year if the medical officer served on active duty in a non-training status for a year or more before entering residency training, provided the prior service was not obligatory for previous military-sponsored specialty training.

Assistant Secretary of Defense for Manpower and Reserve Affairs Roger T. Kelley said the new policy is intended to increase over-all attractiveness of the medical specialty training programs conducted for physicians by the Armed Forces. About 1,400 physicians are in the programs this year.

## Nutrition Experts Find Clues to Weight Problems

Prospects for development of drugs that eventually may counteract physical causes of obesity and emaciation are raised by results of research by U.S. Army medical nutrition experts.

The Office of The Surgeon General, U.S. Army, reported early this month on recent studies by Army scientists at Fitzsimons General Hospital, Denver, Colo. Volunteer subjects were assigned there to the Medical Research and Nutrition Laboratory.

Biopsy capsules on long tubes were inserted through the subjects' mouths to their small intestines and a small piece of the lining was painlessly removed for study of the enzyme activity there. Because the lining has no nerves and rapidly regenerates, the subjects experienced no discomfort.

Overweight, underweight and normal subjects were used in the tests. Overweight individuals were defined as those at least 50 percent over average weight according to insurance company tables, and underweight subjects weighed in at 75 percent or less of the average.

Enzyme activity—a possible cause of hunger sensations—was found to be lower than normal in underweight patients. In a few overweight men, the enzyme activity was higher than nor-

mal and seemed to increase abnormally in proportion to caloric intake.

Army medical scientists say this means that some overweight people may be constantly hungry because their small intestines produce more enzymes than necessary. Some underweight people, on the other hand, may not be as hungry because their small intestines may be less active than average.

Further research is needed to clarify the results, but the hope is that studies some day may lead to drugs to treat people either too fat or too thin.

## Fort Detrick Scientist Receives AALAS Griffin Award

The 1969 Griffin Award from the American Association for Laboratory Animal Science (AALAS) was presented recently to an Army scientist employed at Fort Detrick, Md.

Dr. Melvin M. Rabstein received the award at the annual session of AALAS in Dallas, Tex., "for outstanding accomplishments in the improvement of the care and quality of animals used in biologic and medical research." In conjunction with the award, he was presented a \$500 honorarium.

Dr. Rabstein is chief of the Animal Farm Division, Aerobiology and Evaluation Laboratories, Fort Detrick, where he has been employed since 1948. He was AALAS president in 1961-62 and in 1965 was president, American College of Laboratory Animal Medicine of the American Veterinary Medical Association.



Dr. Melvin M. Rabstein



## BESRL Develops ADP Evaluation for ROTC Cadets

Development of an advanced evaluation system to select ROTC cadets for commissions in the Regular Army was announced in mid-January by the U.S. Army Behavioral Science Research Laboratory (BESRL), Arlington, Va.

BESRL Director Dr. Julius E. Uhlaner said the developmental work was accomplished by the Behavioral Evaluation Research Division, headed by Dr. William H. Helme, and that the system will be used at the 1970 ROTC Advanced Summer Camp.

Automatic data processing provides for rapid computation of a "leadership index" for each cadet in the realistic training situations at the camp. ADP also corrects ratings for differences in rater standards and converts methods to a common base.

The ROTC Advanced Camp Program is primarily a laboratory for leadership development. Evaluation of leadership potential is recognized as having high operational priority during the 6-week period.

Simulated situations realistically patterned for battlefield conditions

## Frankford Aids Lunar Effort By Bomb-Ejection Propellant

Rigidly precise control devices in lunar excursion modules for NASA's Apollo Space Program are being served in part by HES 8028, a propellant developed originally by the Army for use in bomb-ejection cartridges.

Frankford Arsenal's Pitman-Dunn Research Laboratories developed this solid propellant about four years ago as one of numerous heat-resistant, small-grained solid propellants it has originated in the past decade. The arsenal has long been the Army center for research on propellant-actuated devices for military aircraft.

HES 8028 was not designed specifically for the temperature extremes found on the moon, but has been used in all of the Apollo program lunar modules to date. It actuates the six "staging circuit interrupters," which sever all electrical connections between the upper (ascent) and lower (descent) stages of the module.

The separation leaves the descent stage dead until it serves as a launching pad for the astronauts' vehicle, which abandons the lunar surface to rendezvous with the orbiting command module for return to the earth.

Clean-burning HES 8028 is being used in propellant-actuated devices for a variety of purposes by the Air Force, Army, and the National Aeronautics and Space Administration.

subject the cadet to an intensive regime of training and practice. Simulation is said to provide "excellent opportunities to apply scientific techniques to measure leadership ability."

Under the method the new system is scheduled to supplant, a cadet's personal characteristics, including leadership qualities, were given an over-all rating by a single evaluator at the end of the camp program.

The new system, focused on actual performance, evaluates information from several raters, based on repeated observations under simulated combat conditions. The result reduces rater bias and computation error to yield a "better balanced and more accurate appraisal."

Anthony E. Castelnovo of the

BESRL Behavioral Evaluation Research Division explained that each cadet is placed in at least four leadership positions such as company commander, executive officer, first sergeant, platoon leader, platoon sergeant or squad leader, and is evaluated for performance in each assignment.

Evaluations of his leadership ability by specially assigned raters also are obtained during three standard field problems. At the end of the camp, evaluations are obtained from members of the cadet's platoon and the platoon evaluator. All evaluations are processed directly by ADP equipment to generate an index of leadership potential in terms of an Army standard score.

USCONARC Regulation 145-1 prescribes the evaluation procedure.

## Correspondence Course Champ? Picatinny Woman Totals 650 Credit Hours

Correspondence course champion of the R&D community, if not the entire U.S. Army, is a distinction still open to competition. Until a more deserving claimant comes along, Susanne Bernhardt of Picatinny Arsenal has her hat in the ring for the honor.

Susanne has earned enough correspondence school credits for five college bachelor's degrees—about 650 credits with the grade "excellent" in roughly 85 percent of the courses. She usually takes two or three at a time and completes a course in a month, although the Army normally allows six months. She has completed 43 Army courses.

In her effort to gain a well-rounded education to qualify for career advancement in Picatinny's Quality Assurance Directorate, however, she does not confine her interests to Army courses. She travels to nearby schools for other courses.

Currently, she is taking a series of business courses at County College of

Morris, N.J., and has plans for courses at Seton Hall College, where she earned a BS degree, leading to a master's degree in business administration. She also has traveled to Watertown (Mass.) Arsenal and to Rock Island (Ill.) Arsenal for noncorrespondence courses.

Industrial radiography was her first interest at Watertown since she wanted to learn more about X-ray or other penetrating radiation used in nondestructive testing of material. She also studied ultrasonic inspection to discover defects or flaws.

Statistical quality control was taught to her at Rock Island. The range of other technical courses she has completed is impressive. The list includes introduction to ammunition, the Sergeant missile system, introduction to guided missiles, fundamentals of ballistics, fundamentals of optical instruments, and ordnance management.

Among other courses she has completed are electrical fundamentals, introduction to management in logistics, mathematics and measurements, computer fundamentals, nuclear radiation fundamentals, neutrons and the Army calibration system, ammunition destruction and surveillance, review of mathematics and physics, and Pershing missile system.

Susanne may not be crystal clear in explaining how she intends to apply such a wide range of knowledge to her duties. For off-duty time, however, she has qualified with such courses as personnel control devices, and manpower control. Hobbies? Guitar, mandolin, collecting stamps.



Susanne Bernhardt





**DISTINGUISHED SERVICE.** Army Materiel Command (AMC) Deputy CG for Materiel Acquisition *Maj Gen Paul A. Feyereisen* received the Distinguished Service Medal (DSM) for service as the first U.S. program and project manager for the Mallard Project.

The 10-year multimillion-dollar ef-

## Clerk Wins Zornig Award For Individual Achievement

The Zornig Award, one of the two highest awards made annually at the Army Ballistic Research Laboratories, Aberdeen (Md.) Research and Development Center, was presented recently to James D. Wallace, a supply clerk.

BRL Director Dr. R. J. Eichelberger made the award, which recognizes outstanding individual achievement in technical, administrative, mechanical and other related fields at BRL.

Established in 1959, the award honors Col H. H. Zornig, who took charge of ballistics research at Aberdeen Proving Ground in 1935 and who subsequently was largely responsible for organization of the BRL in 1938. He served as BRL director until 1941.

A bronze plaque, emblematic of the award, is mounted on the main BRL building and is engraved with the names of award recipients. Wallace received a small replica of the plaque, a certificate citing him for his accomplishment, and a gold lapel pin. He has been employed at APG since 1962.



**ZORNIG AWARD** winner James D. Wallace accepts citation certificate from Dr. R. J. Eichelberger, director, Army Ballistic Research Laboratories.

fort was established in 1966 to develop an interservice tactical communications network for the United Kingdom, Canada, Australia and the United States.

General F. J. Chesarek, AMC commander, presented the award. The citation reads in part: "General Feyereisen conceived and utilized new management techniques and practices which are now credited as being the key to the outstanding success of the program, both as an international cooperative effort and as a development of vital combat-critical materiel."

"His inspired leadership, extremely high standards and professional knowledge, and adroit handling of sensitive matters directly resulted in national and international acceptance of standards, configuration management and procurement procedures to a degree never before accomplished."

*Col Mary Lipscomb Hamrick* became the first DSM recipient in the 22-year history of the Army Medical Specialist Corps (AMSC) upon her retirement as chief of the Corps.

Lt Gen Hal B. Jennings Jr., The Army Surgeon General, presented the nation's highest noncombat award for distinguished service to Col Hamrick for 10 years of notable achievement.

During this time she served as AMSC Procurement officer with HQ

Fifth U.S. Army, chief of the Food Service Division at Walter Reed General Hospital, chief of the Dietitian Section of the AMSC, and chief of the AMSC since July 1966.

**LEGION OF MERIT.** *Col Vitaly Kovalevsky* received the LOM with Oak Leaf Cluster (OLC) for service as deputy president of the Army Materiel Command Board at the U.S. Army Test and Evaluation Command (TECOM), Aberdeen Proving Ground, Md., from July 1967 until his recent selection to head TECOM's new Test Systems Analysis Directorate.

Col Kovalevsky's achievements in directing project studies of national importance, the citation states, resulted in "sound and far-sighted long-range operational concepts and objectives for the AMC." Penetrating analyses were directed to improvement and integration of Army logistics activities and the weapons systems acquisition processes.

**DISTINGUISHED FLYING CROSS.** *Maj Jerry G. Ledford*, recently assigned to the U.S. Army Combat Developments Command, Fort Belvoir, Va., received the DFC and 44 OLCs to his Air Medal for service in Vietnam. Each OLC represents 25 combat assault missions.

He earned the DFC while serving  
(Continued on page 31)

## Dr. Freitag Assigned Dual Responsibility at WES

Promotion of Dr. Dean R. Freitag to dual responsibility as chief, Office of Technical Programs and Plans, and assistant technical director, was announced recently by the U.S. Army Engineer Waterways Experiment Station at Vicksburg, Miss.

Dr. Freitag is a veteran of 18 years at WES in progressively important assignments. He was chief of the Mobility Research Branch, Mobility and Environmental Division, until he was selected to fill the position vacated in March 1969, when Fred R. Brown was advanced to technical director.

The WES announcement said Dr. Freitag will function as a single information and contact source for the many agencies sponsoring work by WES scientists and engineers in hydraulics, soils, concrete, mobility and environment, nuclear weapons effects, and related programs.

Familiar with all phases of WES technical activities, Dr. Freitag in recent years has been active in computerizing much of the technical effort. He is knowledgeable in the latest techniques for automatic data collection and processing of information obtained in scientific experiments.

After serving 22 months with the U.S. Marine Corps in World War II, Dr. Freitag returned to complete studies at Iowa State University for a BS degree in civil engineering in 1949. Two years later he received a master's degree at Harvard University, and in 1965 earned his doctorate from Auburn University. He spent 1961-62 at Auburn under a Secretary of the Army Research and Study Fellowship.

Listed in *American Men of Science*, Dr. Freitag is a registered professional engineer in the State of Mississippi. Known for a number of technical publications, he is currently associate editor of the *Journal of Terramechanics*, published by the International Society for Terrain-Vehicle Systems.

He is a member of the Lunar Surface Engineering Properties/Trafficability Panel, National Aeronautics and Space Administration.



Dr. Dean R. Freitag



as commander, Troop C, 7th Squadron, Air Cavalry, on a combat mission north of Plei Djereng, in January 1969.

Assigned to the Automatic Data Processing and Management Information Directorate, Maj Ledford is monitoring development of the TACFIRE System that automates specific field artillery functions through automatic data processing.

**BRONZE STAR MEDAL.** "Better late than never" applies to the award of the BSM with "V" device to *M/Sgt Robert J. Gogan*, now serving with the U.S. Army Engineer Reactors Group, Fort Belvoir, Va.

*M/Sgt Gogan* (then a corporal) was serving with the 1st Battalion, 8th Cavalry Regiment, 1st Cavalry Division, during the Korean War when he displayed the heroism that earned the BSM—presented 18 years later.

The citation credits *Gogan* with heroic action, while exposed to heavy hostile artillery fire, in clearing a minefield that endangered the forward movement of troops and supplies near Sojong-ni, Korea, Mar. 8, 1951.

The award was authorized but never presented as the sergeant moved from one duty station to another. In a recent casual conversation with his first sergeant, *Gogan* mentioned never having received the medal. The first sergeant then initiated the action that resulted in presentation of the award.

**MERITORIOUS SERVICE.** *Col Earl W. Grogan*, assistant to the director, Agent Development and Engineering Laboratories, Fort Detrick, Md., was awarded the MSM for service from July 1966 to June 1969 as staff veterinarian and as a veterinary detachment commander in Japan.

*Col Grogan* was presented the Army Surgeon General's "A" Prefix award late in 1968 for achieving outstanding professional competence and for continued demonstration of knowledge in

### **Belvoir Branch of SRSA Elects Segal President, New Members**

*Stanley M. Segal*, a physicist at the Night Vision Laboratory, Fort Belvoir, Va., has been elected president of the Belvoir Branch of the Scientific Research Society of America (SRSA) for 1970.

Other newly elected officers of the scientific group include *Dr. Tibor G. Horwath*, vice president; *Fred Myers*, treasurer; *James P. Mergenhausen*, secretary. *John D. Grabski* and *Dr. George Merkel* were installed as new members of the executive and admissions committees, respectively.

All are employed at the U.S. Army Mobility Equipment R&D Center, except *Myers*, who is employed by the Army Engineer Topographic Labs.

the Army Medical Services.

**COMMENDATION MEDAL.** *Col John R. Adie*, CO of the U.S. Army Aviation Materiel Laboratories, recently presented ARCOM Medals to two former first lieutenants for service at Fort Eustis, Va.

Receiving the awards were *Mayo K. Emory*, who served as chief of the Support and Analysis Branch, Contracting Office, from November 1967 to December 1969, and *Elroy E. Siegler*, who was adjutant and later management analyst at the laboratories from January 1960 to December 1969. Both retired from military service.

*SFC Roy J. Pirtle* was awarded the ARCOM for exceptionally meritorious service as an electronics devices instructor at the U.S. Army Mobility Equipment R&D Center (MERDC) at Fort Belvoir, Va. Now assigned to the U.S. Army Engineer School at Belvoir, he was presented the medal in recognition of his services from October 1967 to October 1969.

**COMMENDATIONS.** Certificates for Outstanding Performance Ratings were awarded recently in the Office, Chief of Research and Development, HQ DA.

*Brig Gen George Sammet Jr.*, Director of Plans and Programs, presented the awards to *Albert T. Finnell*, *Mrs. Elinor J. Rousseau* (with Sustained Superior Performance Award), *Miss Catherine G. Buarnitz* (with Quality Step Increase), *Miss Sandra C. Fidler* and *Miss Carol A. Humes* received Sustained Superior Performance Awards.

*Brig Gen John W. Barnes*, Director

### **Rotary Selects Natick Researcher for Philippine Tour**

U.S. Army Natick (Mass.) Laboratories' meteorologist *Eugene Wong* has been chosen by Rotary International for an 8-week tour of the Philippines.

Rotary sponsors group study exchange programs between paired districts in different parts of the world to promote global good will and understanding on a person-to-person basis.

*Wong* is a member of Rotary District 791 in eastern Massachusetts and was selected for participation in community affairs as well as for his scientific background.

*Dr. Paul Dalrymple*, chief of Natick's Regional Environments Division, Earth Sciences Laboratory, selected *Wong* after a visit in 1969 by a group of Filipinos to Rotary District 791, their U.S. counterpart affiliate.

While in the Philippines, *Wong* will present two papers on meteorological aspects of air pollution and city planning. He will live with Philippine families and is scheduled to visit local factories, plantations, educational and government facilities.

Employed since 1967 at Natick Laboratories, where he analyzes micrometeorological data obtained in Antarctica, he previously was a research meteorologist at GCA Corp., Bedford, Mass., and at Edgewood Arsenal, Md.

*Wong* has served as a councilman and secretary of the Chinese-American Civic Association of New England. He has worked in community education programs on urban renewal, drug abuse and related problems in Boston's South Cove area.

of Developments, presented Outstanding Performance Ratings to *Mrs. Betty F. Kleindienst* and *Miss Rose O'Toole* (with SSPA).

**LENGTH OF SERVICE.** A 40-year service pin was presented to *Robert C. Cothran* in the Office of the Project Manager, Night Vision (PMNV), Fort Belvoir, for a combination of military-civilian service.

He served in the Army from 1929 until 1952, then became a civilian employee of the MERDC (formerly the Engineer R&D Labs) at Fort Belvoir.

### **Army Sergeant Earns \$7,000 Through Suggestion Program**

Design and development of an air-mobile communications switchboard recently earned an Army staff sergeant \$7,000, one of the largest cash awards made to a soldier through the Army Suggestion Program.

Lt Gen Charles W. Eifler, USA-REUR and Seventh Army Deputy Commander-in-Chief, presented the check to *S/Sgt Tommy R. Nichols*, an operations sergeant in the Office of Communications and Electronics, U.S. Army Europe (USAREUR) and Seventh Army.

*Nichols'* field telephone switching central has been in use in the Republic of Vietnam since 1965. Technically known as the Central Office Group, Telephone, AN/MTC-10, the communications device has been produced for combat units of brigade and division size. It replaced larger and heavier equipment that was not readily air-transportable.



Eugene Wong



# Army Reports on Advance in Meningococcal Meningitis Control

**EDITOR'S NOTE:** Results of research reported in this article are being acclaimed as a major breakthrough by the U.S. Army Medical Department and its Medical Research and Development Command in combatting Group C meningococcal meningitis. The article, which details investigations since sulfadiazine-resistant strains of meningococci appeared in recent years, cautions that research must continue on Groups A and B to develop an effective trivalent vaccine.

\* \* \*

By Dr. M. S. Artenstein and Col E. L. Buescher

Meningococcal meningitis has been an important military medical problem since mobilization for World War I when epidemic infection with high mortality swept training camps in the winter of 1917-1918.

Mobilization during World War II brought the problem to attention again. Control of the disease became possible when it was found that outbreaks in Army camps could be prevented or aborted by sulfadiazine, given prophylactically.

An abrupt end to effective prophylaxis came in 1963-1964 when sulfadiazine-resistant strains of meningococci appeared and spread rapidly. In the absence of alternative measures prevention of meningitis was not possible and the recruit training center at Fort Ord, Calif., was forced to suspend operations.

Impact of the disease is greatest in Army training centers since most meningococcal meningitis occurs in recruits. Morbidity and mortality statistics (Table 1) provide little clue to the emotional response meningitis outbreaks engender in medical and line commanders.

A research program, sponsored in the Army Medical Department by its Research and Development Command, has brought the epidemiology, treatment and prevention of meningococcal disease under study by modern approaches, and has produced a vaccine which offers great promise in the prevention of this disease in recruit populations.

**The organism.** The etiologic agent, *Neisseria meningitidis*, like poliomyelitis, has three distinct immunological groups: A, B and C. It is clear that group A strains were the cause of epidemics recorded at 8- to 10-year intervals throughout the 20th century. Meningococci of serogroups B and C have been responsible for most of the sporadic meningitis occurring between nationwide epidemics.

Since intensive study began in 1963-1964, group A strains have been virtually absent from the U.S. Organisms of groups B and C have caused almost all the meningococcal meningitis seen in this country in both civilian and military populations. The in-

creasing number of sulfadiazine-resistant strains isolated from Army patients is shown in Table 2.

Even though group A strains have been rare in the U.S. in the past decade, these organisms have been responsible for outbreaks in many other parts of the world. Especially in Africa, sulfadiazine-resistant strains have been identified.

During the winter months at several recruit training centers, silent nasopharyngeal infections with meningococci are highly prevalent. Approximately 15 percent of young men entering military service are nasopharyngeal carriers upon arrival from civilian life. During intervals of maximal transmission, as many as 85 percent of troops will be asymptomatic carriers of the organism upon completion of training. These men do not develop systemic disease, and the infection is often an immunizing one.

**Antibiotic prophylaxis.** Chemoprophylaxis is unreliable at present. No other drug has proven capable as sulfadiazine formerly was in preventing meningococcal disease or transmission of the organism. Many common antibiotics, such as penicillin, tetracycline and erythromycin, are ineffective.

An experimental antibiotic, Rifampin, has shown promise recently in small trials. More extensive studies seem warranted, although caution is

advised because a tendency for Rifampin-resistant mutants to appear has been observed with other bacteria.

**Immunity.** Investigations of the immune response to meningococcal infection were hindered for many years by the lack of tests for antibody and an animal model for study.

Following the development of several types of antibody tests at the Walter Reed Army Institute of Research (WRAIR), it became possible to examine serum specimens collected from patients with meningitis as well as individuals with asymptomatic respiratory infection (carriers).

Results of these tests led to the conclusion that susceptibility to meningococcal disease is related to a selective deficiency of humoral antibodies to pathogenic strains. It was found that the proportion of individuals with serum meningococidal activity was inversely related to the incidence of disease.

For example, the prevalence of this antibody was lowest in infants 6 to 24 months old, an age when disease rates are highest. Sera obtained prior to illness in 54 recruits were found to be deficient in antibodies to meningococci. In comparison, 82 percent of recruits who did not develop meningitis had circulating antibodies at the time of induction into the Army.

Other studies of recruits have demonstrated that infection of the nasopharynx without systemic disease is an efficient immunizing process. Ninety-two percent of carriers developed increased antibody titers to their own meningococcus; 87 percent developed antibody to other meningococcal serogroups.

Studies of children suggested that active immunization occurs as a result

TABLE 1  
Meningococcal Disease—U.S. Army

	1966	1967	1968	1969*
Cases	390	234	510	194
Deaths (%)	31 (8.0)	24 (10.0)	35 (7.0)	16 (8.0)

\*Incomplete data

TABLE 2  
Sulfadiazine Resistance Among Meningococci  
Recovered From Troops

	1964	1965	1966	1967	1968	1969*
Group B—No. of strains	197	118	216	50	30	10
% SR	65	55	71	61	57	60
Group C—No. of strains	16	15	38	88	269	125
% SR	12	8	65	85	95	99

\*Through March only

SR = Resistant to sulfadiazine 1 mcg/ml



**TABLE 3**  
Percent of Recruits Who Became  
Carriers of Group C Meningococcus

Company	Vaccination Status		
	Con- trols	A Vac- cine	C Vac- cine
B-6-3	42	37	24*
E-5-3	38	--	4.6***
E-2-3	69	68	31***

\* P = <0.05

\*\*\* P = <0.001

of carriage of nonpathogenic meningococci. Antigenic determinants which initiate an immune response to the meningococcus include the group-specific polysaccharide, cross-reactive antigens and type- or strain-specific antigens.

*Development of a vaccine.* In the Department of Bacterial Diseases, Walter Reed Army Institute of Research, attention was focused upon the meningococcal polysaccharides as potential vaccines for several reasons.

First, pneumococcal capsular polysaccharides had been extensively studied over a 30-year period and had been shown to be effective, safe vaccines. Second, methods for meningococcal polysaccharide extraction and characterization were described more than 10 years before.

Using methods described by Kabat, researchers prepared meningococcal group A and C polysaccharides and analyzed them physico-chemically. These polysaccharides had an average molecular weight of less than 50,000.

Since work with dextrans had shown that polysaccharides with molecular weights in this range are poorly immunogenic in man, it was desirable to prepare meningococcal polysaccharides with average molecular weight exceeding 100,000.

The objective was attained by rapid precipitation of the polysaccharide from culture fluids using the cationic detergent Cetavlon. A series of purification steps was devised to remove extraneous proteins and nucleic acids.

While attempts to produce antibodies in mice, rabbits, monkeys and chimpanzees proved unsuccessful with these polysaccharides, results in human volunteers were entirely different. Each vaccinated person developed antibodies within a week of inoculation.

Antibody response was observed by a variety of techniques. Most important was the polysaccharides' capacity to evoke increases in bacterial antibody since this antibody correlates with resistance to natural infection.

**TABLE 4**  
Protection Afforded Recruits by Immunization  
With Group C Polysaccharide

MGC Infections		Total Number of Men	
		Vaccinated 13,763	Nonvaccinated 54,309
Group C	No. Cases Rate*	1 0.07+	38 0.70+
Group B	No. Cases Rate*	4 0.29	3 0.06

\*No. Cases/1000/8 weeks

+P<.01

In original volunteers, antibody has persisted for at least one year or longer.

Further studies with the Group C vaccine were carried out in volunteers at an Army recruit training center where very high carrier rates for Group C meningococci were common.

Distributed evenly among three basic training companies, 150 immunized volunteers were studied by nasopharyngeal cultures every two weeks for the 8-week training period. No adverse reactions to vaccine occurred, and all immunized persons developed antibody.

Analysis of pharyngeal culture data showed acquisitions of Group C meningococci to be significantly reduced among immunized recruits as compared to unimmunized controls (Table 3).

Vaccination appeared to result in a local nasopharyngeal immunity as well as the development of serum antibody. However, the immunity was directed only against Group C organisms. The vaccine did not prevent the acquisition of other serogroups of meningococci.

The first large-scale field trial to determine whether the Group C vaccine

protects against disease under conditions of natural exposure was completed recently. This study was conducted by Walter Reed Army Institute of Research under sponsorship of the United States Medical Research and Development Command in Army recruits at Forts Dix, Knox, Polk, Bragg, Lewis and Ord.

To date, in this and other studies, more than 20,000 volunteers have received the Group C vaccine without any significant toxic reactions. In the field trial, the attack rate of Group C meningococcal disease was reduced 10-fold in the vaccinated recruits compared to the nonvaccinated (Table 4).

Although one case of Group C meningitis did occur in a vaccinated recruit, the reduction in attack rate suggests that the vaccine may provide at least 90 percent protection. Additional field trials of the vaccine will be required to document definitely the extent of vaccine effectiveness.

Since this vaccine protects only against Group C and there exist two other major serogroups of meningococci—A and B—prevention of meningococcal disease will require the use of a trivalent vaccine directed against all three groups.

#### THE AUTHORS:

Dr. Malcolm S. Arntsen has been chief of the Department of Bacterial Diseases, WRAIR, since 1966. He was assigned to WRAIR as a civilian (1964) as assistant chief, Department of Virus Diseases, Department of Communicable Disease and Immunology. As an Army captain, serving as a virologist at WRAIR (1962-64), he was credited (along with Col Edward L. Buescher and Capt Paul D. Parkman) with isolating the German measles virus. He earned his AB at Brown University (1951), MD at Tufts University (1955), interned at Mt. Sinai Hospital (1956-58) and took his residency in medicine at the Boston VA Hospital (1956-58).

Col Edward L. Buescher has been director and commandant of WRAIR since 1969. He has been serving simultaneously as director, Division of Communicable Disease and Immunology at WRAIR since 1967. The colonel holds a BS degree from the University of Dayton (1945) and an MD from the University of Cincinnati (1948). He interned at Cincinnati General Hospital and has served on important medical committees and boards.





# Laser Physicists Acclaim Information in New Book

Laser physicists are acclaiming a new publication, Volume 2 in the series on *Landolt-Bornstein Numerical Data and Functional Relationships in Science and Technology*, authored principally by Dr. Rudolph Bechmann, U.S. Army Electronics Command.

Assigned to the ECOM R&D Laboratories, Fort Monmouth, N.J., Dr. Bechmann has achieved wide recognition in recent years for his research and publications in the field of quartz crystals and related devices used in electronic equipment. He has authored more than 100 scientific articles.

Known also as an inventor, with 53 patent awards, Dr. Bechmann was awarded the electronic industry's C. B. Sawyer Memorial Award in 1966 for work in radio frequency control.

The new book was written in collaboration with other noted leaders in laser technology and published by Springer-Verlag of Germany and New York City. Dr. Bechmann authored Section 2, "The Elastic, Piezoelectric and Dielectric Constants of Piezoelectric Crystals," and Section 4, "First and Second Order Piezoelectric and Electrooptic Constants of Crystals."

Section 1, "The Elastic Constants of Nonpiezoelectric Crystals," is the work of R. F. S. Hearmon, England, who with Dr. Bechmann coauthored Section 3, "The Third-Order Elastic Constants." Dr. S. K. Kurtz, a former Bell Telephone Laboratories scientist now with Phillips Research Laboratories, teamed with Dr. Bechmann in preparation of Section 5, "Second-Harmonic Generation of Light in Crystalline Solids."

Dr. Harold Jacobs, senior research

consultant in the ECOM Electronic Components Laboratory, commented in Section 5 by saying: "The data Dr. Bechmann has compiled and added to this book is by far the most detailed and up-to-date information found in one volume. It is tied in with the very latest developments in laser devices and applications."

In explaining the significance of progress reported in Section 5, Dr. Jacobs stated: "It has been found that by means of specific electrooptic materials, the wavelengths of lasers can be converted from one region of the spectrum to another; for instance, a laser normally operating in the infrared region, upon passing through these materials, will emit a green light. This phenomenon is called second-harmonic generation.

"Furthermore, by means of another process, the radiation in a laser can be converted in a limited fashion to any value within a certain range. This is called a parametric interaction. This ability to chance wavelengths (color)



Dr. Rudolph Bechmann

is analogous to frequency modulation in the radio spectrum—one of the major goals of laser physicists today."

Born in Germany, Dr. Bechmann has been with the Fort Monmouth laboratories since 1956. He is a Fellow of the American Physical Society, the American Association for the Advancement of Science, the New York Academy of Science, and Institute of Electrical and Electronic Engineers.

## Edgewood Slates Environmental Pollution Conference

Edgewood (Md.) Arsenal, long recognized for research on atmospheric contaminants, will be host Apr. 15-16 to a meeting on "Environmental Pollution," sponsored jointly by the Chemical-Biological Division of the American Ordnance Association and the U.S. Army.

Presentations will be made by arsenal scientists whose studies of sampling and detection in the atmosphere, and in water, along with disposal of wastes, have contributed to develop-

ment of instrumentation and methods used by government and industry.

Additional presentations are programmed for representatives of the National Air Pollution Control Administration, Federal Water Pollution Control Administration, Bureau of Solid Waste Management of the Environmental Control Administration, Department of Defense Pollution Control Committee, and industrial firms.

Dr. Henry S. Rothrock, chairman of the AOA Chemical-Biological Division, is chairman for the sessions. Col Norman I. Shapira (USA, ret.) is program chairman and Elmer Engquist is the Edgewood Arsenal coordinator for arrangements.

Attendance applications will be mailed to AOA C-B Division members in mid-February. Additional applications can be requested by writing or calling Cmdr Arthur D. Sullivan (USN, ret.), AOA, Union Trust Building, 15th and H Streets NW., Washington, D.C. 20005. Telephone (202) 347-7250.

## TOW Missile Accuracy Exhibited

Thirty-two hits out of 35 firings at long-range targets were recorded at HQ U.S. Army Missile Command, Redstone Arsenal, Ala., late in January when soldiers from Fort Benning, Ga., Fort Knox, Ky., Aberdeen Proving Ground, Md., and Fort Jackson, S.C., engaged in training practice. None had ever fired the TOW system.

## Col Lamb Takes Over as CDC Director of Materiel

Col Joe B. Lamb, former deputy director of Developments and chief, Combat Materiel Division, Office of the Chief of Research and Development, HQ DA, is the new director of Materiel, U.S. Army Combat Developments Command (CDC), Fort Belvoir, Va.

Before serving in OCRD, he was CO of the 4th Training Brigade, Fort Jackson, S.C., senior adviser to a Vietnamese airborne brigade (1963-64), and on the staff of the Command and General Staff College (1959-62).

He commanded Company G, 35th Infantry in the Korean War and subsequently was operations officer, executive officer and commanding officer of the 2d Battalion, 35th Infantry. During World War II, he was a public relations officer with the Third Army in Europe.

Col Lamb is a graduate of the Infantry Officer's Advanced Course, Command and General Staff College, and the Industrial College of the Armed Forces. He has a bachelor's degree from Omaha University and an MBA degree from George Washington University. He has been awarded the Legion of Merit, Air Medal, Army Commendation Medal and Combat Infantryman's Badge.



Col Joe B. Lamb



# News magazine Lists Key Articles Published During Past Year

*Publication of a complete index of all articles published in the Army Research and Development Newsmagazine during the past year admittedly would be desirable. Space available permits a listing of headlines of only the more important highlight articles.*

## DECEMBER 1968

U.S., U.K. Sign Fuel Cell Research Pact.  
SOMISS Report Stimulates Intensive Data Management Effort.  
Memo Expands R&D Role of Corps of Engineers.  
ARPA Sets Final Test of New Jet Flying Belt.  
ASA (R&D) Compares Army, Industrial Laboratories.  
Defense Secretary Clifford Urges R&D 'Coupling' to Civilian Use.  
Edgewood Arsenal Develops Automatic Alarm for Nerve Agents.  
AR 70-35 Prescribes Procedures, Responsibilities for 5 Programs.  
5 Laboratories Consolidated in Aberdeen R&D Center.  
SARS Fellow at Cambridge Participates in RNA Research Project.  
ECOM, CE Exhibit R&D Achievements at AAAS Meet.  
EDS&R to Provide Direct Access to Engineering-Based Data.  
CDC Commanders Discuss Army's 1975-85 R&D Needs.

## JANUARY

Hornig OKs Guidelines to Technical Reports. \$5,000 and ECS Award Recognizes Night-Vision Progress.  
MERDC Appoints OCRD Man as Technical Director.  
Eyeglass Innovation Cuts Soldiers' Lost Duty Time.  
CDC Conducts GIANT Map Study for 1970-75 Time Frame.  
Battelle Economists Forecast FY 1968 R&D Trends.  
Two Chemical Products Play Strategic Role in Vietnam Combat.  
BRL Studying Nonmetallic Bands to Improve Artillery Shells.  
USATACOM Using Mathematical Models for Mobility valuation.  
ARO-D Supports Arctic Environmental Changes Mobility Study.  
Army Cold Regions Knowledge Aids Alaskan Oil Field Development.  
HEL Schedules Human Factors Tests for MBT-70.

## FEBRUARY

Corps of Engineers Moving Toward Operation of Facility to Aid Construction Methods.  
Department of Defense Posture Statement Outlines Projections of R&D Activities to Meet Objectives.  
Wikner Succeeds McMillan as MACV Scientific Adviser.  
AMC Selects Dr. Kaufman as Successor to Dr. Siu.  
Hershner Heads TARC; 4 New Members Chosen.  
Iberall Study Prods Thinking on Research Programs.  
Long-Range R&D Program Directed to Modernizing Defense Language Program.  
HumRRO Project IMPACT Progresses in Computer-Administered Instruction.  
R&D Advances Aiding Supply Distribution for Military Operations.  
USAEPG Tests KA-60 Aerial Camera.  
WSMR Adopts Triggering System for High-Speed Cameras.

## MARCH

Army Centralizes Responsibility in Computer Systems Command.  
Westmoreland Addresses Army Scientific Advisory Panel.

## JANUARY 1970

Chesarek Assumes Control of Army Materiel Command.  
Night-Vision Aids Used in Effort to Save Cattle.  
Department of Defense Armor Materials Program.  
3 Services Use TACSAT I in Satellite Communications Program.  
Army Concentrates R&D in New Fiber, Polymers Laboratory.  
USATACOM Develops X-Ray Standards for Partial Penetration Welds.  
Natick Earth Sciences Lab Reports SEA Environmental Research.  
USATACOM Heat Pipe Research Points to Military Applications.

## APRIL

USAR R&D Units Yielding to Mob Des Change June 30.  
Quadruped Demonstrates Potential Capabilities.  
Resor Approves 3 Exceptional Civilian Service Awards.  
CE Studies Use of Laser to Control Weeds in Water.  
Lt Gen Betts Cites Military-Industrial Team Benefits.  
ARO-D 1953 \$14,000 Basic Research Grant Returns Big Payoff.  
Army Defines Environmental Pollution Control Efforts in AR 11-21.  
Campus Turbulence Tears at Traditions.  
WECOM Adopts Microfilm System for Retrieval of Industrial Catalog Data.  
U.S. Army Helps Chile Design, Procure Dental Vans for Remote Areas.  
Chief of R&D Discusses AHFRAC Accomplishments.

## MAY

R&D Achievement Awards Recognize Services of 45 Employees.  
AMC Slates Realignment Approved by Chief of Staff.  
Project THEMIS Expanded by 26 Research Programs.  
Engineers Corps Centers R&D Control in New Office.  
7th National JSHS Achieves Peak of Success at USMA.  
WES Launches Extensive Sensor Systems Research Programs.  
TATAWS Project Aiding Future Tank-Antitank Capability of Army.  
WES to Celebrate 40th Anniversary June 18.  
Army Environmental Hygiene Agency Performs Critical Functions.  
BESRL Conducts Human Performance Research for Night Operations.

## JUNE-JULY

Engineers Regain Control, Restore Name of CRREL.  
ISO Centers OCRD Information Management.  
ASC Paper Proposals Given Oct. 20 Cut-Off.  
Group Seeks Aircraft in 60-Ton Lift Class.  
Kwajalein Radar Complex Memorializes Lt Col Kiernan.  
ASAP Weighs Airmobility Gains, Challenges.  
Industry Asks Army Aid on Northwest Passage.  
Armed Forces Day Talk Answers Military-Industrial Complex Critics.  
Army Judges Select 20 International Science Fair Winners.  
DDR&E Discusses Safeguard System as Essential Defense.  
Army Medical Biomechanical Research Lab Serves Many Needs.  
Ancient Greek Tragedy, Present-Day Ethics.  
Exploitation of Metals Solidification Research.  
Defense Secretary Cites 3 Army Men Among 6 Distinguished Service Awards.

## AUGUST-SEPTEMBER

Army Sets 15th Conference on Design of Experiments.  
Engineers Dedicate Construction Engineering Research Lab.  
Dr. Tucker Takes Over as Principal Deputy DDRE.  
AFFRI Nears End of 8-Year Construction Program.

Services OK First Design of Mobile Power Source.  
DDRE Discusses University-Defense R&D Ties.  
Edgewood Arsenal Dedicates 5th New Lab in 21 Months.  
Civilian Applications Increasing for Army Night-Vision Devices.  
AMC Employees Draw Anniversary Acclaim, Challenge.  
AMMRC Creates Institute for Advanced Materials, Mechanics, Design.  
OPO Seeks Increased Participation in Special Career Programs.  
CAL/AVLABS Symposium Centers on Short-Hop Flight Problems.  
Army Surgeon General Heaton Views Medical Advances on Anniversary.  
SATCOM Terminals Provide Communications for Apollo 11 Operations.  
Institute of Land Combat Completes Move Into New Building.  
CDC Task Force, RIPOSTE Deals With Surveillance, Night-Vision.  
Guide Details Preparation Operations Research Study Proposals.

## OCTOBER

Army Distributing Master Plan for Management Information.  
ARP-70 Reflects Emphasis Shifts to Achieve Future Army Goals.  
Army R&D Units Convert to Mob Des Detachments.  
HumRRO Terminates 18-Year GWU Link.  
Safeguard System Debaters Support ABMDA Mission.  
U.S. Steel Foundation Announces \$2.37 Million Aid to Education.  
Technological Application of Basic Research Supported by ARO-D.  
Letterman Army Institute of Research Reviews Gains, Goals.  
CRD Betts Cools Critics of M-1 Complex at AOA-NSIA Conference.  
Arctic Test Center's Mission Traced on 20th Anniversary.  
Article Cites Army CBR Research Benefits to Civilian Population.  
CofS Westmoreland Speaks in Support of Army ROTC Program.  
Laird Discusses Future R&D Programs With College Student Interns.  
AMC CG Chesarek Acclaims AOA Logistic Support Role.  
Army Developing 155mm Systems to Meet Field Artillery Requirements.  
AMMRC Aims at Improving Materials by Atomic Mechanism Study.  
R&D Activities Traced in Life Cycle of Army Military Vehicles.  
Secretary of Defense and Army Staff Chiefs Brief ASAP.

## NOVEMBER

Senate Confirms Robert Johnson as ASA (R&D).  
Youden Gets Wilks Award at Design of Experiments Conference.  
Maj Gen Norton Leaves AVSCOM for MASTER Key Role.  
Top Food Leaders Discuss Food for the Military Man.  
8 Nations Renew Satellite Communications Pact.  
Army R&D Leaders Take Lead Roles in Eason; Apstein Receives Award.  
Quad Cities' 12-Year Effort Produces Graduate Study Center.  
Deseret TC Develops Diagnostic Tool to Identify Disease Carriers.  
AUSA Meeting Stresses Forces of Change Reshaping U.S. Army.  
Secretary of Defense Details Technological Superiority Complexities.  
CRD Discusses Aircraft Requirements at Army-Industry Meet.  
Technical Data + Configuration Management + Computer Programs = Data Control.  
AMMRC Investigates Composite Materials for Army Applications.  
USARIEM Aims at Protection of Soldier for Maximum Effectiveness.  
Patents Viewed as Economics Factor, R&D Information Source.





3 1262 09682 6762

# Battelle Economists Forecast Based on \$25.7 Billion Projected in 1970

Based upon a forecasted 1970 \$25.7 billion research and development effort in the United States, industrial R&D activities will account for a modest growth and the U.S. Government program will continue its downward trend in recent years.

This projection of the total R&D effort, made by economists at the Columbus (Ohio) Laboratories of Battelle Memorial Institute, takes into consideration inflationary trends. This factor could cause a reduction of as much as seven percent in the real level of R&D activities.

Federal government spending is predicted at \$15 billion for calendar year 1970, based upon estimated funding sources. Industry is expected to account for about \$9.4 billion. University and college R&D spending is estimated at about \$922 million, and not-for-profit institute expenditures at roughly \$408 million.

Federal R&D funds in 1970 are expected to be down by about \$200 million from the total for 1969, industry funding is likely to be up about \$300 million. The forecast is that colleges and universities will supply \$66 million in additional funds, and that other not-for-profit institutions will provide about \$31 million in additional funds.

The U.S. Government thus will be the source of 58 percent of the R&D funds spent in 1970, a decline of one percent from the 1969 estimate. Industry is expected to provide about 36 percent of all R&D support, up slightly from the 1969 estimate.

The 3.6 percent that colleges and universities are expected to provide and the remaining 1.6 percent from other not-for-profit sources would represent modest increases in their shares.

While the U.S. Government continues as the major source of R&D funds, the forecast notes that its share of total funding has declined from a high of just over 65 percent in 1964 to the 58 percent estimated for 1970.

The industry-funded share has increased from about 31 percent in 1964 to 36 percent in 1970. Proportionate contributions of colleges and universities and of other not-for-profit institutions have remained more nearly stable, but seem also to have edged upward as the federal share has declined.

Over the past 10 years, federal expenditures have grown at a compounded rate of about 7 percent annually, but have slowed over the past three years to about 3 percent annually.

Taking a longer look at the future, the forecast predicts that, over the next 10 years, the growth of federal R&D expenditures is not likely to exceed 4 percent per year—without correction for inflationary costs.

Rate changes and absolute changes have very different implications, it is explained. For example, from 1959 to 1969, the actual total dollar increase in federal R&D funding was about \$7

billion, and the annual growth rate was just under 7 percent. If growth continues at 4 percent annually, dollar volume will gain by about \$7 billion in the next decade. In other words, a growth rate of just over half of that of the past decade will yield an equal dollar increment.

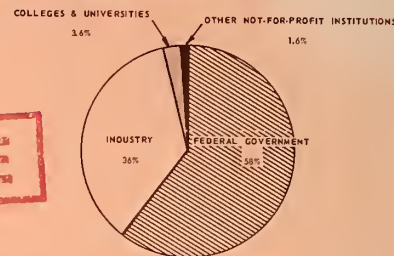
Although the U.S. Government is the dominant source of research funds, industry performs about 70 percent of all research and is, in its own right, a substantial source of R&D dollars. The Battelle forecast sees industry performing nearly \$18 billion of R&D out of the predicted 1970 total of \$25.7 billion. Slightly more than half of the \$18 billion, 51.9 percent, will be from industry funds.

That industry now supplies more than 50 percent of the funds for the research it performs is indicative of the growing importance management attaches to R&D, the forecast observes. By way of contrast, industry supported only 41 percent of its own R&D activity in 1959, and, as recently as 1964, slightly below 44 percent. Industrial support of its own R&D rose to 48.9 percent in 1967 and 1968, and to an estimated 50.1 percent in 1969.

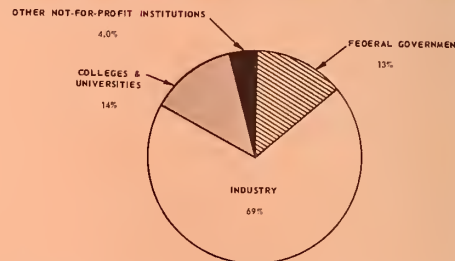
Not-for-profit institutions—colleges, universities, and independent organizations—both fund research and conduct research supported by federal agencies and by industrial companies.

In 1970, the not-for-profits are expected to provide 5.2 percent of all funding, reflecting, in part, money re-

## Distribution by SOURCE of Funds



## Distribution by PERFORMANCE of R&D



1970 R&D Expenditures in the U.S.—The total forecast by Battelle Memorial Institute's Columbus Laboratories is \$25.7 billion. Distribution as shown here reflects decline in federal, rise in industrial funds.

ceived from foundations and state and local governments, and to perform about 18 percent of all R&D. Both figures reflect a modest increase over those estimated for 1969.

A breakdown of the forecast total for the not-for-profit sector shows that, in 1970, colleges and universities will perform 77.5 percent, with the remainder performed by other not-for-profit organizations. Over the years, there has been a gradual shift from academic to nonacademic institutions.

Inflationary forces on R&D costs are expected to have greater influence on the change in real R&D effort than will the projected 1969-70 change in total expenditures. Increases in the costs of R&D inputs, the forecast states, have more than absorbed recent increases in R&D support.

In deflated dollars, adjusted to a 1968 base, the level of real U.S. R&D effort is estimated to have reached its peak in 1967, falling by 1.6 percent in 1967-68 and by 5.6 percent in 1968-69.

The calendar year forecast was prepared by Dr. W. Halder Fisher and Leonard L. Lederman, Battelle economists. Data were drawn from various sources, including the fiscal year figures of the U.S. Bureau of the Budget; National Science Foundation; the McGraw-Hill Survey—Business' Plans for R&D Expenditures; and analyses conducted by Battelle's socio-economics research group in Columbus and by its Washington, D.C., office staff.